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FINAL Environmental Impact Statement

Northern Rockies Lynx Management Direction Volume I

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Northern Rockies Lynx Management Direction
Final Environmental Impact Statement

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Abstract: The Forest Service is proposing to incorporate management direction into land management plans that conserves and promotes the recovery of lynx. The Final Environmental Impact Statement (FEIS) discloses the effects of six alternatives which were developed to meet the purpose and need and respond to primary issues.

Public comments collected during scoping were used to identify primary issues, management concerns, alternatives and the scope of the Draft EIS (DEIS). The DEIS was submitted for public comment in January 2004. Over 5,000 comment letters and e-mails were received, read, and considered in the development of the FEIS. Comments were used to verify primary issues, correct and clarify information presented in the DEIS and modify alternatives. A new Alternative (Alternative F) has been developed in response to public and other agency comments on the DEIS. Alternative F is the FEIS preferred alternative. Six alternatives, including no action, were fully developed and considered in the FEIS.

In addition, Alternative F evaluates the effects of where to apply the management direction through two Scenarios. Scenario 1 would apply the management direction to *all* lynx habitat in the planning area. Scenario 2 would apply the management direction only to *occupied* lynx habitat.

The Bureau of Land Management (BLM) was originally a cooperating agency in this proposal but has since decided to modify their plans through a separate planning process.

Purpose and need

The Purpose and Need is to incorporate management direction that conserves and promotes recovery of Canada lynx, by reducing or eliminating adverse effects from land management activities on National Forest System (NFS) lands, while preserving the overall multiple-use direction in existing plans.

Proposed action

In order to provide conservation and recovery of Canada lynx the Forest Service (FS) is proposing to incorporate management direction into land and resource management plans for 18 national forests (NF) in Idaho, Montana, Utah, and Wyoming (see Table 1-2 and Figure 1-1). The specific proposed management direction is described in Alternative B found in Chapter 2 of this document (see Table 2-1).

The Bureau of Land Management (BLM) was originally a cooperating agency in this proposal but has since decided to modify their plans through a separate planning process.

Background

The U.S. Fish and Wildlife Service (FWS) listed Canada lynx as a threatened species in March 2000, saying the main threat was the lack of guidance to conserve lynx in 10- to 15-year-old national forest and Bureau of Land Management (BLM) plans. The FS and BLM signed conservation agreements with the FWS to consider the Lynx Conservation Assessment and Strategy (LCAS) during project analysis, and the FS agreed to not proceed with project determinations of "likely to adversely affect" lynx. This management direction would replace these agreements.

The management direction primarily relies on the science and recommendations from several sources:

- *Ecology and Conservation of Lynx in the United States* (2000), which summarizes current knowledge; and
- *Lynx Conservation Assessment and Strategy* (LCAS) (2000), which recommends conservation measures for activities which could place lynx at risk by altering their habitat or reducing their prey.
- FWS's *Final Listing Decision and Remand Notice (2000 and 2003),* which determined the Canada lynx was a threatened species. The Listing Decision and Remand Notice identified threats to lynx populations and lynx individuals.

Public involvement

The public has been involved from the time when the FS first began trying to determine the scope of public interest in the project, on September 11, 2001, when a notice was published in the *Federal Register*, Volume 66, Number 176, pp. 47160-47163.

On August 15, 2002, a Notice of Intent to prepare an Environmental Impact Statement was published in the *Federal Register*, Vol. 67, No. 158, pp. 53334-53335. The FS prepared an EIS because of the level of interest expressed during scoping. FEIS Chapter 2 summarizes public involvement efforts.

The DEIS was released in January 2004. Over 5,000 comments were received. Comments were used to verify primary issues, correct and clarify information presented in the DEIS and modify alternatives. A new alternative, Alternative F, was developed in response to public and other agencies comments.

Issues

The scoping process was used to identify conflicts associated with the Proposed Action and to identify issues to use as a basis for developing alternatives. Comments that addressed the effects of the Proposed Action were sorted into *primary issues*. Five primary issues were identified. They reflect conflicts between lynx conservation and alternative uses of natural resources.

1. Over-the-snow trails

Issue: What are the effects of limiting the growth of designated over-the-snow routes on opportunities for over-the-snow recreation?

2. Wildland fire risk

Issue: What are the effects of management direction on the risks of wildland fire to communities?

3. Winter snow shoe hare habitat in multistoried forests

Issue: What is the effect on lynx of allowing projects in winter snowshoe hare habitat in multistoried forests?

4. Precommercial thinning

Issue: What are the effects of limiting precommercial thinning on restoring tree species and forest structures that are declining?

5. FWS Remand Notice

Issue: What level of management direction should be applied to activities that the FWS remand notice found were not a threat to lynx populations?

These primary issues were used to develop alternatives to the Proposed Action that meet the Purpose and Need. Several *management concerns* were also identified as a basis for formulating alternatives.

Additional management concerns addressed in alternatives

Internal agency comments, as well as some public comments, expressed other concerns about the Proposed Action, largely involving procedural or administrative considerations rather than environmental consequences. Some people thought the Proposed Action would increase the complexity, cost, or rigidity of management without comparable benefits for lynx. These concerns have been addressed by developing different language in alternatives – see Chapter 2 for details.

Alternatives considered in detail

The range of alternatives was determined by evaluating the public letters sent during the scoping period, the comments on the DEIS, and the Purpose and Need. The level of scientific information available on lynx and lynx habitat, the FWS Listing Decision, the Remand Notice, and ESA requirements were also considered.

Within these parameters, the alternatives developed display a reasonable range to guide future projects, respond to the issues, and meet the Purpose and Need. Six alternatives were developed in detail. Chapter 2, Table 2-1 shows the differences in management direction among the action alternatives, B, C, D, E, and F.

- *Alternative A* is the no-action alternative. In this case, no action means no change to the existing plans, and no management direction to address the listing of lynx.
- *Alternative B*, the Proposed Action, was developed from conservation measures recommended in the LCAS. Alternative B addresses activities on National Forest System lands that can affect lynx and their habitat.
- *Alternative C* was designed to respond to issues of over-the-snow recreation management and foraging habitat in multistoried forests, while providing a comparable level of protection to lynx as Alternative B, the Proposed Action.
- *Alternative D* was designed to address the issues of managing over-the-snow recreation and multistoried forests, similar to Alternative C. Alternative D also allows some precommercial thinning in winter snowshoe hare habitat, but still contributes to lynx conservation.
- *Alternative E* addresses the issue of wildland fire risk while contributing to lynx conservation. It also responds to statements made in the Remand Notice, which states the FWS has no information to indicate that grazing or snow compaction is a threat to lynx at this time. Alternative E was identified as the preferred alternative in the DEIS.
- ***Alternative F is the FEIS preferred alternative.*** *Alternative F* was developed in response to comments

on the DEIS. Alternative F addresses concerns regarding Alternative E, the DEIS preferred alternative. Many people felt Alternative E would not meet the purpose and need because it did not provide adequate regulatory mechanisms to adequately address lynx needs.

- Alternative F was designed to provide adequate regulatory mechanisms for those risk factors found to be a threat to lynx populations. Alternative F also addresses the issues of wildland fire risk while contributing to lynx conservation. It responds to statements made in the Remand Notice, which state the FWS has no information to indicate that grazing or snow compaction is a threat to lynx at this time. Alternative F has been identified as the preferred alternative in the FEIS.
- In addition, Alternative F evaluates the effects of where to apply the management direction through two Scenarios. Scenario 1 would apply the management direction to *all* lynx habitat in the planning area. Scenario 2 would apply the management direction only to *occupied* lynx habitat.

Management direction considered

Some public comments offered suggestions for management direction beyond that found in the initial scoping letter, or in Alternatives A through E in the DEIS. Each of these suggestions was considered. The suggested directions were compared to the Proposed Action and the other alternatives, to see whether they represented a distinctly different approach but still met the Purpose and Need.

Some of these suggestions were dismissed from detailed consideration; other were used to formulate Alternatives C through E in the DEIS and Alternative F in the FEIS. How each of the suggestions was considered is summarized and discussed in the FEIS Chapter 2 *Management direction considered*.

Nature of effects

The proposal is programmatic in nature, consisting of direction that would be applied to future management activities. It does not prescribe site-specific activities on the ground, or irreversibly commit resources. Council on Environmental Quality regulations define *direct effects* as those occurring at the same time and place as the action. There are no direct environmental consequences; therefore the analysis in the FEIS discusses only *indirect* and *cumulative* effects of the alternatives, including disclosing the indirect effects of not taking future actions. Direct effects would result from site-specific projects, and will be evaluated when those decisions are made.

In analyzing effects, it is assumed the standards would be met because complying with standards is

mandatory. The analysis of effects is based primarily on projections of how future activities and areas would change because of the proposed standards. Such projections are inherently uncertain.

It is also assumed that the objectives generally would be achieved and the guidelines generally followed, though that may not always be true.

The baseline for effects disclosed in this chapter is the existing plans. The effects of existing plans have been previously determined and disclosed. The FEIS Chapter 3 describes changes in effects resulting from incorporating lynx conservation measures. Chapter 2, Table 2-2 summarizes the effects.

Generally, effects are presented as changes from existing plans, represented by Alternative A. Some effects on lynx are presented by comparing them to Alternative B, the Proposed Action, which was designed to conserve lynx. Cumulative effects include the effects of the existing plans.

Decision framework

The FEIS has been prepared to evaluate the effects of the Proposed Action, and to look at alternative ways of achieving the Purpose and Need, while responding to the primary issues and management concerns.

The responsible officials will decide whether or not to incorporate management direction into existing plans for the conservation and recovery of Canada lynx, and if so, what that direction would contain and where it would apply.

Responsible officials

Kathleen McAllister, Deputy Regional Forester for the Northern Region, has been directing the preparation of the FEIS. The responsible officials are:

- Kathleen McAllister, Acting Regional Forester, Northern Region, Region 1, PO Box 7669, Missoula, Montana 59807;
- Rick Cables, Regional Forester, Rocky Mountain Region, Region 2, PO Box 25127, Lakewood CO, 80225;
- Jack Troyer, Regional Forester, Intermountain Region, Region 4, Federal Building, 324 25th Street, Ogden, UT 84401

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Chapter I Purpose and need

Purpose and need

The Purpose and Need is to incorporate management direction into land management plans that conserves and promotes recovery of Canada lynx, by reducing or eliminating adverse effects from land management activities on national forest system lands, while preserving the overall multiple-use direction in existing plans.

Background

Canada lynx habitat can be found in Colorado, Idaho, Maine, Michigan, Minnesota, Montana, New Hampshire, New York, Oregon, Utah, Vermont, Washington, Wisconsin and Wyoming (see Figure 1-2). In the western United States, lynx habitat is found primarily on federal lands.

Lynx inhabit moist coniferous forests that experience cold, snowy winters and provide a prey base of snowshoe hare. Lynx habitat is primarily found on moist sites that support subalpine fir, Engelmann spruce and lodgepole pine forests. In extreme northern Idaho and northwestern Montana, cedar-hemlock forests also are considered lynx habitat.

Lynx habitat is generally found at mid to upper elevations. The lower elevation ranges from 3,500 feet in the northern to 7,000 feet in the southern portions of the Northern Rockies lynx planning area (see Figure 1-1, the planning area map).

On July 8, 1998, the Fish and Wildlife Service (FWS) proposed to list Canada lynx as a threatened species under the Endangered Species Act (ESA). The Forest Service (FS) and Bureau of Land Management (BLM) responded to the declining status of lynx in 1998 by establishing a team of international experts in lynx ecology to collect and summarize scientific data. This resulted in the publication *Ecology and Conservation of Lynx in the United States* (Ruggiero et al. 2000a).

Based on this information, an interagency team of government biologists developed the *Lynx Conservation Assessment and Strategy* (Ruediger et al. 2000) (LCAS). The LCAS recommended conservation measures for federal lands in the contiguous United States. The

conservation measures focus on managing vegetation within the historic range of variability, maintaining dense understory conditions for prey, minimizing snow compaction, and identifying and maintaining connectivity within and between habitat areas.

In December 1999, the FS and BLM prepared a *Biological Assessment* (BA) (Hickenbottom et al. 1999) of 57 national forest land and resource management plans and 56 BLM land use plans; these were the units with lynx habitat in them. The assessment found the existing plans were likely to adversely affect lynx because they did not contain direction to conserve lynx.

In February 2000, five FS Regional Foresters and four FWS Regional Directors signed a *Lynx Conservation Agreement* (USDA FS, USDI FWS 2000) to promote the conservation of lynx and its habitat.

The conservation agreement requires the agency to review and consider the recommendations in the LCAS before making any decisions about projects in lynx habitat. The FS also agreed not to authorize projects, except for 3rd party projects, likely to adversely affect lynx until a decision is made about changing existing plans. (An example of a 3rd party project would be an individual or company requesting road access across federal land to private land.) The agreements say any changes in long-term management direction will be made by amending or revising the existing plans.

In April of 2000, the FWS listed lynx as a threatened species (USDI FWS 2000b; Appendix O). In its Listing Decision, the FWS said,

> *" We conclude that the single factor threatening the contiguous United States distinct population segment of lynx is the lack of guidance for conservation of lynx and snowshoe hare habitat in National Forest Land and Resource Plans and BLM Land Use Plans."*

Formal consultation on existing plans required by ESA was completed on October 25, 2000, when the FWS issued its *Biological Opinion* (USDI FWS 2000a). In the Biological Opinion, the FWS said existing plans as applied together with the conservation agreements, were not likely to jeopardize the continued existence of lynx.

> The FWS listed lynx as threatened, effective April 24, 2000.
>
> The FWS had concluded that the chief threat to lynx in the contiguous United States was the lack of guidance in federal plans.

In March 2001, the FS and BLM developed schedules to amend or revise their existing plans – see Appendix D.

In September 2001, the FS and BLM initiated the Northern Rockies Lynx Amendment, a proposal to incorporate management direction into the existing plans for 22 units in the northern Rockies.

In December 2006, the BLM elected to not be a cooperating agency in this planning process. BLM will incorporate management direction for lynx into the resource management plans through their regular update schedule. The proposal is now limited to the 18 national forest units in the Northern Rockies (see Figure 1-1).

In July 2003, the FWS issued a *Notice of Remanded Determination of Status for the contiguous United States Population of Lynx* (USDI FWS 2003; Appendix P). In it, the FWS reaffirmed its decision to list the lynx as threatened, rather than endangered.

In January 2004, the FS and BLM issued the Draft Environmental Impact Statement (DEIS) for the Northern Rockies Lynx Amendment.

In May of 2005 the FS and FWS signed a new *Canada Lynx Conservation Agreement* (USDA FS, USDI FWS 2005) to replace the 2000 conservation agreement, which had expired. The 2005 agreement was only good until December 31, 2006 and only applied to National Forest System land mapped as occupied lynx habitat, and was only in force until the forest plans were amended or revised to conserve lynx.

The agreement said the agency agrees to review and consider the recommendations in the LCAS prior to making any new decision to undertake actions in occupied lynx habitat.

The FS also agreed not to authorize projects likely to adversely affect lynx (except for projects or authorizations required by law or which are necessary to protect or reduce risk to human health or safety) until a decision is made about changing existing plans.

The agreement also said the agencies will work together to identify occupied habitat. In May 2006 the agencies defined occupied habitat on national forests in the northern and southern Rocky Mountains and the Cascade Range (Forest Service Region 1, 2, 4 and 6) (USDA FS, USDI FWS 2006). All lynx habitat on an entire national forest is considered "occupied" by lynx when:

1. There are at least two verified lynx observations or records since 1999 on the national forest unless they are verified to be transient individuals; or
2. There is evidence of lynx reproduction on national forest.

Based on these considerations nine national forest units within the planning area are considered occupied; four units contain a mix of occupied and unoccupied habitat (the isolated mountain ranges on these units are unoccupied), and six units are not occupied – see Table 1-1 and Figure 1-1.

Note, in October 2006, a new *Canada Lynx Conservation Agreement* (USDA FS, USDI FWS 2006) was signed and is in effect until December 31, 2010 or until all National Forests with occupied lynx habitat have been amended or revised. This agreement is the same as the one approved in 2005, but covers a longer period.

In September 2005, the FWS issued a *Recovery Plan Outline for the Contiguous United States Distinct Population Segment of Lynx* (USDI FWS 2005a). The document serves as an interim strategy to guide recovery efforts and inform the critical habitat designation process until a draft recovery plan is completed. Formal

recovery planning is likely to begin in early 2007.

The recovery outline categorizes lynx habitat and occurrence as 1) core areas, 2) secondary areas, and 3) peripheral areas.

Core areas have the strongest long-term evidence of lynx persistence. Lynx have consistently been found in these areas and there is recent (within the past 20 years) evidence of reproduction. Five national forests have been identified as core areas and another six forests contain both core areas and secondary areas - see Table 1-1.

Secondary areas have fewer and more sporadic current and historical records of lynx, and as a result historical abundance has been relatively low. Reproduction has not been documented. Eleven national forests have been classified as secondary areas - see Table 1-1.

Peripheral areas contain few verified historical or recent records of lynx; records are sporadic and are usually associated with periods when there were unprecedented population highs in Canada. The Ashley and Bighorn National Forests have been classified as peripheral habitat, as well as the Pryor Mountains on the Custer NF and the Highwood and Snowy Mountains on the Lewis and Clark NF.

The recovery outline identifies four preliminary objectives for calculating progress toward the goal of delisting lynx. The objectives are:

1. Retain adequate habitat of sufficient quality to support the long-term persistence of lynx populations within each of the identified core areas.
2. Ensure sufficient habitat is available to accommodate the long-term persistence of immigration and emigration between each core area and adjacent populations in Canada or secondary areas in the United States.
3. Ensure habitat in secondary areas remains available for continued occupancy by lynx.
4. Ensure threats have been addressed so that lynx populations will persist in the contiguous United States for at least the next 100 years.

On November 9, 2006 the FWS issued the *Designation of Critical Habitat for the Contiguous United States Distinct Population Segment of Lynx* (USDI, FWS 2006). The FWS designated three areas as critical habitat for the lynx. These areas are: 1) Voyageurs National Park in northeastern Minnesota; 2) Glacier National Park in North-western Montana; and 3) North Cascades National Park in North-central Washington. No National Forest System land was designated as critical habitat because these lands were found to already provide special management and/or protection for lynx.

Critical habitat is defined in the ESA. It is a specific geographic area(s) that contain features essential for the conservation of threatened or endangered species and that may require special management and protection. Critical habitat may include an area that is not currently occupied by the species but that will be needed for its recovery. To be included in a critical habitat designation, the habitat within the area occupied by the species at the time of listing must have features "essential to the conservation of the species".

Table 1-1. Application of occupied/unoccupied habitat, and draft recovery area to units in the planning area

	Occupied/Unoccupied Based on Conservation Agreement		Recovery Outline Categories		
Unit	**Occupied**	**Unoccupied**	**Core**	**Secondary**	**Peripheral**
Flathead	X		X		
Kootenai	X		X		
Lolo	X		X		
Helena*	X	X	X	X	
Idaho Panhandle #	X		X	X	
Targhee	X		X	X	
Custer*	X	X	X	X	X
Gallatin*	X	X	X	X	
Bridger-Teton	X		X		
Shoshone	X		X		
Lewis and Clark*	X	X	X	X	X
Clearwater	X			X	
Nez Perce		X		X	
Salmon-Challis		X		X	
Beaverhead-Deerlodge		X		X	
Bitterroot		X		X	
Ashley		X			X
Bighorn		X			X

Only the NE corner of the Idaho Panhandle NF is identified as core habitat
* The isolated mountain ranges on the Custer, Helena, Gallatin and Lewis and Clark NFs are unoccupied; see Figure 1-1 and Appendix C.

** The Pryor Mountains on the Custer and Highwood and Snowy Mountains on the Lewis and Clark NF are considered peripheral habitat.

References: USDA FS, USDI FWS 2006a; USDI FWS 2005a

Need for management direction

The LCAS identified risks to lynx and lynx habitat. The 1999 BA found many of the risk factors were not addressed in existing plans. Plan direction is needed to guide project-level decisions in order to avoid or reduce adverse effects from management activities and to maintain or improve Canada lynx habitat. Developing plan direction that will reduce or eliminate the risks identified in the LCAS is part of the Purpose and Need of this proposal.

Risk factors affecting lynx productivity were discussed in detail in the LCAS (Ruediger et al. 2000, pp. 2-2 to 2-15), and include particular activities related to:

- Timber management
- Wildland fire management
- Livestock grazing
- Recreational uses
- Forest backcountry roads and trails
- Other human developments

Lynx require certain habitat elements to persist in a given area, including foraging and denning habitat. *Foraging habitat* supports lynx primary prey, snowshoe hare, year-round. *Winter snowshoe hare habitat* occurs where many young trees or shrubs grow tall enough to protrude above the snow. This can happen in young regenerating forests that grow up after a disturbance, or in older forests with a substantial understory of shrubs and young trees. *Denning habitat* is found in areas with large amounts of woody debris, either down logs or root wads (LCAS, pp. 1-2 to 1-10).

Activities such as timber harvest, fire suppression and livestock grazing, can affect the amount, distribution, and condition of lynx denning and winter snowshoe hare habitat (LCAS, pp. 2-2 to 2-6, 2-13 to 2-14).

Other predators may affect lynx. Lynx have a competitive advantage in places where deep, soft snow tends to exclude other predators in mid-winter, the time when prey is most limiting (Ruggiero, 2000, pp. 83 to 100).

Activities that result in providing access to other predators are also a potential risk to lynx. Such activities include certain types of winter recreation, the winter use of forest roads and trails, and other human developments (LCAS, pp. 2-6 to 2-13, 2-14 to 2-15).

Risk factors affecting mortality were discussed in detail in the LCAS (pp. 2-15 to 2-17), and include particular activities related to:

- Trapping
- Shooting
- Predator control

Many of the risk factors to lynx had not been identified at the time the existing plans were developed – the purpose and need is to conserve lynx by addressing these risk factors as they apply to National Forest System lands, by adding to or changing management direction.

- Highways
- Predation by other species

These factors can directly cause lynx deaths. Trapping of lynx is no longer allowed in the planning area. Incidental or illegal shooting can occur, but is regulated by state agencies. Predator control activities are conducted by USDA Wildlife Services. These risk factors are not addressed in this Final Environmental Impact Statement (FEIS) because decisions about them are outside the authority of the FS.

Highways are a known source of direct mortality (LCAS, pp. 2-16 to 2-17).

Anything that increases the presence of predators also may contribute to indirect mortality (LCAS, p. 2-16).

Risk factors affecting movement were discussed in detail in the LCAS (pp. 2-17 to 2-19), and include particular activities related to:

- Highways and associated development
- Private land development

Lynx are known to disperse over wide areas. Highways and the developments associated with them may impede lynx movement (LCAS, p. 2-17). The FS has only limited authority to address highways, and no authority to control what happens on private land.

The FWS decision to list lynx as threatened was based on a subset of these risks, which threaten the lynx population as a whole. Threats to lynx populations influenced by national forest land management include certain timber harvest regimes and fire suppression, as well as the lack of guidance to address these threats in existing plans. Lynx conservation and recovery requires that the plans address these threats.

Since the LCAS was issued the FWS published a Clarification of Findings in the Federal Register (Appendix P). This Clarification of Findings is commonly referred to as the Remand Notice.

In the Remand Notice the FWS states, "We found no evidence that some activities, such as forest roads, pose a threat to lynx. Some of the activities suggested, such as mining and grazing, were not specifically addressed [in the Remand Notice] because we have no information to indicate they pose threats to lynx" (p. 40083).

Later they state, "Because no evidence has been provided that packed snowtrails facilitate competition to a level that negatively affects lynx, we do not consider packed snowtrails to be a threat to lynx at this time" (p. 40098).

In regards to timber harvest the FWS state, "Timber harvesting can be beneficial, benign, or detrimental to lynx depending on harvest methods, spatial and temporal specifications, and the inherent vegetation potential of the site. Forest practices in lynx habitat that result in or retain a dense understory provide good snowshoe hare habitat that in turn provides good foraging habitat for lynx" (p. 40083). These findings by FWS shed a different light on what management direction is needed to maintain or improve Canada lynx habitat.

Proposed action

The FWS's *Lynx Biological Opinion (USDI FWS 2000a)* concluded:

> *...if Plans are amended or revised incorporating conservation measures in the LCAS or the equivalent thereof...the Plans would likely not jeopardize the continued existence of lynx.*

In keeping with the 2000 Biological Opinion, the FS proposes to incorporate management direction into the land and resource management plans for 18 NFs in Idaho, Montana, Utah, Washington, and Wyoming (collectively the "*existing plans*"). The management direction would provide for the conservation and recovery of Canada lynx. To respond more quickly and consistently, management direction is considered for the planning area as a whole, rather than addressing each plan individually. The new management direction seeks to preserve the overall multiple-use direction in existing plans by avoiding making significant changes to the plans. Adjustments to individual plans may be considered as they are revised during the next several years.

The FS is the lead agency responsible for preparing this proposal. The original Proposed Action was based on conservation measures recommended in the LCAS as a way to achieve lynx conservation. Measures from the LCAS were reorganized and rearranged to make it easier to include them in the existing plans. Every effort was made to preserve the intent of the measures in the LCAS.

The original Proposed Action is now called Alternative B and has changed somewhat from how it was described in the fall of 2001 when the agencies asked for public comments on the scope of the proposal. It was rewritten in the DEIS to provide clearer management direction by organizing it better and eliminating duplication. Throughout this document, references to the Proposed Action mean Alternative B, the Proposed Action as described in the DEIS and in Chapter 2 of this document. Appendix A is a comparison of the LCAS with the scoping version of the proposed action; the DEIS Proposed Action, Alternative B; and the FEIS preferred alternative, Alternative F.

The Proposed Action would add or modify management direction in existing plans and would consist of one or more of the following:

- *Goals,* which are general descriptions of desired results;
- *Objectives,* which are descriptions of desired resource conditions;

Alternative B, the Proposed Action, has changed from how it was described during scoping. It was rewritten to provide clearer management direction by organizing it better and eliminating duplication.

- *Standards,* which are management requirements designed to meet the objectives; and
- *Guidelines,* management actions normally taken to meet the objectives.

The existing plans contain general resource management direction. Plans do not compel management activities to occur. Whether goals and objectives are achieved depends on agency budgets and competing priorities. Standards may prohibit some management activities from occurring; however, standards can be changed through subsequent plan amendment or revision. Guidelines are recommendations, and following them is discretionary; however, documentation of reasons for not following them may be required. (The term "guideline" is not defined in the 1982 planning regulations, and the term "standard" is not used in the 2005 planning regulations.)

This proposal is limited in scope. It is not intended to and does not encompass all the issues or resource needs that may be considered when plans are revised. The proposal adds only those goals, objectives, standards, and guidelines relating to specific lynx habitat risk factors. The proposal would not change the land-use allocations in existing plans.

The proposed action applies only to lynx habitat in lynx analysis units (LAUs) (for a discussion of LAUs see the *Lynx* section in Chapter 3), and to lynx linkage areas.

The proposal does <u>not</u> make a decision about what lynx habitat is or where linkage-area boundaries are, or how they are identified.

Lynx habitat and linkage areas used in this analysis are based on the best current inventory information available at this scale – see Figure 1-1 displaying lynx habitat and linkage areas. This information has been compiled under the guidance of the Interagency Lynx and Wolverine Steering Committee. See Appendix B for a description of how the maps used for the analysis was prepared; see the *List of Preparers* for a description of the Committee and its role.

The Proposed Action considers information from a number of sources including the following:

- *Ecology and Conservation of Lynx in the United States* (Ruggiero et al. 2000a)
- LCAS, *Canada Lynx Conservation Assessment and Strategy* (Ruediger et al. 2000)
- FWS's *Final Listing Rule, Federal Register,* Vol. 65, No. 58, 16051-16086 (USDI FWS 2000b; Appendix O)
- FS and BLM's BA, *Biological Assessment of the Effects of National Forest Land and Resource Management Plans and Bureau of Land Management Land Use Plans on Canada Lynx* (Hickenbottom et al. 1999)
- FWS's *Lynx Biological Opinion* (USDI FWS 2000a)

These documents present a summary of scientific knowledge on issues relevant to lynx conservation, and are available on-line at: www.fs.fed.us/r1/planning/lynx.html.

Administrative units

The LCAS identifies five geographic areas that provide habitat for lynx in the United States – see Figure 1-2 on the following page. Each geographic area has unique ecosystems and management histories. This proposal would apply to National Forest System lands located within the Northern Rocky Mountains Geographic Area. This geographic area encompasses lands in Idaho, Montana, Oregon, Utah, Washington and Wyoming.

Eighteen national forests in FS Regions 1, 2, and 4 are included in this FEIS– see Table 1-2.

The federal lands affected by this proposal include lynx habitat and linkage areas inside these units, and are referred to as the planning area. The number of plans affected by this proposal is different from the number of units affected, because some units have been consolidated. Units and plans affected by this proposal are:

Table 1-2. Administrative units and plans included in this analysis

Forest Service		
Idaho national forest units	FS region	Land and resource management plan
Clearwater	1	Clearwater forest plan
Idaho Panhandle	1	Idaho Panhandle forest plan
Nez Perce	1	Nez Perce forest plan
Salmon-Challis	4	Salmon forest plan
	4	Challis forest plan
Caribou-Targhee	4	Targhee forest plan
Montana national forest units	FS region	
Beaverhead-Deerlodge	1	Beaverhead forest plan
	1	Deerlodge forest plan
Bitterroot	1	Bitterroot forest plan
Custer	1	Custer forest plan
Flathead	1	Flathead forest plan
Gallatin	1	Gallatin forest plan
Helena	1	Helena forest plan
Kootenai	1	Kootenai forest plan
Lewis and Clark	1	Lewis and Clark forest plan
Lolo	1	Lolo forest plan
Utah national forest units	FS region	
Ashley	4	Ashley forest plan
Wyoming national forest units	FS region	
Bighorn	2	Bighorn forest plan
Bridger-Teton	4	Bridger-Teton forest plan
Shoshone	2	Shoshone forest plan

Figure 1-2. US lynx geographic areas

Not all the FS and none of the BLM units inside the Northern Rockies geographic area are included in the FEIS. Existing plans for eleven national forests in the geographic area would not be changed by this proposal. These include:

- In Region 4, the Payette, Boise, Sawtooth, Caribou, Wasatch-Cache, and Unita NFs, which have completed revising their plans. Information from this proposal has been used in developing those plans.
- In Region 6, the Colville, Umatilla, Wallowa-Whitman, Malheur, and Ochoco NFs. They will address lynx through separate planning efforts.

From the beginning the BLM units in Montana, Wyoming, and most of Utah, were not part of this proposal. They have or will address lynx as needed in separate processes. The BLM units included in the DEIS were limited to those in Idaho and northwest Utah.

The BLM in Idaho has recently started revising and replacing their existing plans, and anticipates that all out-of-date plans will be replaced and address lynx habitat needs within the next few years. Due to these changed circumstances the BLM has withdrawn as a cooperating agency from the FEIS.

The revision schedule in Appendix D shows the tentative timetable for Forest Service planning efforts. Of the forest plans that would be affected by this decision most will probably be revised within the next few years. The Targhee and Bighorn NFs already revised their plans; in 1999 and 2005 respectively. Once this decision is in place, individual plans may be amended or revised as needed to respond to new information or local conditions.

Scope

"Scope" is defined in 40 CFR 1508.25 as the range of actions, alternatives and impacts to be considered in an environmental analysis. The Proposed Action and its alternatives consist of a goal, objectives, standards and guidelines. The FEIS addresses their effects.

To determine the scope of an environmental impact statement, agencies consider three kinds of alternatives, three kinds of impacts and three kinds of actions.

Alternatives considered

The analysis evaluates three types of alternatives:
- The no-action alternative, Alternative A;
- The Proposed Action, Alternative B; and
- Other reasonable courses of action, Alternatives C, D, E, and F.

Alternatives C, D, E, and F also include measures that address primary issues.

Impacts considered

Three kinds of environmental impacts are possible, direct, indirect and cumulative.

Direct effects are those that occur at the same time and place as the action. There are no direct environmental consequences of the proposal. The proposal is programmatic in nature, consisting of direction that would be applied to future management activities. It does not prescribe site-specific activities on the ground, and therefore would have no direct environmental effects. Direct effects would be disclosed later at the project level, when site-specific decisions are made.

This analysis evaluates the *indirect* and *cumulative effects* of the Proposed Action and alternatives. An indirect effect is one caused by the action, but occurs later in time or further removed in distance, but is still reasonably foreseeable (40 CFR 1508.8). Cumulative effects are environmental consequences that result for the incremental impact of an action added to other past, present, and reasonable foreseeable action. Cumulative impacts can result form individually minor but collectively significant action taking place over a period of time (40 CFR 1508.7).

Actions considered

Connected actions

Connected actions are closely related actions that:
- Automatically trigger other actions;
- Cannot or will not proceed unless other actions are taken previously or simultaneously; or
- Are interdependent parts of a larger action and depend on that larger action for their justification.

The Proposed Action includes the management direction needed to fulfill the identified Purpose and Need.

Other planning efforts are underway to address lynx management in other places, such as the proposal for national forests in the Southern Rockies geographic area (USDA FS 2000a), and BLM's separate planning efforts. These actions are not considered connected because:

- Each plan can stand on its own;
- The areas have different ecosystems and management histories; and
- The decisions can be made independently under the National Forest Management Act (NFMA) for FS and Federal Land Policy and Management Act (FLPMA) for BLM.

Cumulative actions

Cumulative actions are those which, when viewed with past, other present and reasonably foreseeable actions, may have cumulatively significant impacts and should be discussed in the same environmental analysis.

Other programmatic actions on BLM, FS, other federal, tribal, state, and private lands have been evaluated where information is available to determine the cumulative effects. This analysis is described in Chapter 3 and Appendix L.

Similar actions

Similar actions are those that have similar timing or are geographically close to the Proposed Action. These actions may be considered in the same environmental analysis as the Proposed Action and its alternatives.

The Southern Rockies Lynx Amendment effort is underway in Colorado, as are BLM's planning efforts in the states of Idaho, Montana, Utah, and Wyoming. Those efforts are not included with this one because of differing ecosystems, management histories, and regulations.

Legal background

The following laws and regulations apply to all the resources analyzed. Others apply only to a specific resource area, and are described in Chapter 3 in the section about that resource.

Multiple-Use Sustained-Yield Act
The Multiple-Use Sustained-Yield Act says the national forests are established and shall be administered for outdoor recreation, range, timber, watershed and wildlife and fish purposes.

NFMA
The National Forest Management Act and 36 CFR 219 provides direction to the FS about developing, maintaining and revising land and resource management plans. NFMA says plans must provide a sustained yield of goods and services and provide for multiple uses, in a way that will both maximize long-term net public benefits and be environmentally sound.

ESA
The ESA and 50 CFR 402 apply to federal lands and direct federal agencies to use their authorities to carry out conservation programs for listed species. ESA directs federal agencies to make sure their actions are not likely to jeopardize the continued existence of any threatened or endangered species, or result in the destruction or adverse modification of critical habitat. Under ESA, Canada lynx is listed as a threatened species, and is the focus of this proposed management direction.

Decision framework

This FEIS has been prepared to evaluate the effects of the Proposed Action, and to look at alternative ways of achieving the Purpose and Need, while responding to the *primary issues* described in Chapter 2.

The responsible officials will decide whether or not to incorporate direction for lynx conservation and recovery, and if so what that direction would contain and where it will apply. The responsible officials may approve one alternative or a combination of measures from different alternatives.

Once approved in the Record of Decision, the goal, objectives, standards, and guidelines of the chosen alternative would be incorporated, under the 1982 planning regulations, into the existing Forest Plans. If a conflict exists between the management direction in the chosen alternative and an existing plan, the more restrictive direction would apply.

If a decision is made to incorporate management direction into the existing plans by adopting these lynx conservation measures, it would not be an irreversible decision. Forest Plan decisions can be modified again or revised, subject to the National Environmental Policy Act (NEPA) and ESA consultation.

Responsible officials

Kathleen McAllister, Deputy Regional Forester for the Northern Region, has been directing the preparation of the FEIS. The responsible officials are:

- Kathleen McAllister, Acting Regional Forester, Northern Region, Region 1, PO Box 7669, Missoula, Montana 59807;
- Rick D. Cables, Regional Forester, Rocky Mountain Region, Region 2, PO Box 25127, Lakewood CO, 80225;
- Jack G. Troyer, Regional Forester, Intermountain Region, Region 4, Federal Building, 324 25th Street, Ogden, UT 84401.

How information is presented

FEIS Volume 1

Chapter 1

Chapter 1 explains and describes the *Purpose and Need* for the proposal and the scope of the decision.

Chapter 2

Chapter 2 presents *primary issues* and *management concerns* identified during scoping and in comments to the DEIS. Then it describes and compares in detail alternatives to the Proposed Action that respond to the primary issues and management concerns. Chapter 2 also describes management direction considered, and other concerns that did not lead to alternatives.

Chapter 3

Chapter 3 presents the *affected environment* and the *environmental effects* of the alternatives considered in detail.

Chapter 4

Chapter 4 includes a list of who prepared this document and a list of agencies and groups contacted.

Supporting information

Supporting information, including a glossary of terms and a bibliography of references, follow Chapter 4.

Appendixes

The appendices contain more detailed information used in the effects analysis and are frequently referenced in the text. For the FEIS Appendices O and P were added. Appendix O is the original Canada lynx listing decision issued by FWS on March 24, 2000 (USDI FWS 2000). Appendix P is the *Remanded Determination of Status for the Contiguous United States Distinct Population for Canada Lynx,* issued by FWS on July 3, 2003 (USDI FWS 2003).

FEIS Volume 2

This volume contains our Responses to the Comments that we received from the public and other agencies on the DEIS.

The project record

The Project Record is referenced throughout this document. It includes the information used for analysis and made available to the responsible officials.

Upon request, information from this file can be provided or made available for review. Contact the Northern Rockies Lynx Amendment at the Regional Forester's Office, P.O. Box 7669, Missoula, Montana 59807. Much of the information is available on-line at www.fs.fed.us/r1/planning/lynx.html.

Chapter 2 Alternatives

Introduction

The NEPA regulation at 40 CFR 1502.14 state Chapter 2, which describes the alternatives, is the heart of the environmental impact statement. Based on the information and analysis presented in Chapter 3, the regulations state Chapter 2 should compare the environmental impacts of the proposal and the alternatives, sharply defining the issues and providing a clear basis for choice among options.

Chapter 2 describes Alternative B, the Proposed Action, developed in response to the Purpose and Need identified in Chapter 1. It also describes alternatives to the Proposed Action, including a no-action alternative (Alternative A), which is defined as no change from existing plans.

Three alternatives were developed by changing some of the standards and guidelines to respond to comments raised during the initial scoping period. These changes were used to create Alternatives C, D, and E. No changes were made to the goal or the objectives.

Alternative F was developed for the FEIS based on comments received from people and agencies who reviewed the DEIS. They suggested different objectives, standards, and guidelines, or different combinations of them, or they had concerns about the impacts the standards or guidelines might have (see Volume 2, *Response to Comments*). The FS considered these comments on the alternatives. These comments were used to revise and rearrange the standards and guidelines to create Alternative F. Along with the other alternatives, the effects of Alternative F are analyzed in full in Chapter 3 of the FEIS.

If an action alternative is chosen, the goal, objectives, standards, and guidelines of the chosen alternative would be incorporated into those existing plans under the 1982 planning regulations that currently do not have management direction for lynx consistent with the ESA. If a conflict exists between the management direction in the chosen alternative and an existing plan, the more restrictive direction would apply. The goal, objectives, standards, and guidelines for any alternative chosen would be applied to all future, site-specific projects.

Public participation

The public has been involved in this proposal from the time the FS first began trying to determine the scope of public interest in the project, on September 11, 2001, when a notice was published in the *Federal Register*, Vol. 66, No. 176, 47160-47163. The notice announced we were accepting public input on the lynx proposal.

Originally, the scoping period was scheduled to end on October 26, 2001, but it was extended to December 10, 2001. We gave people more time to comment, both in response to several requests for extensions, and because of the general disruption stemming from the September 11th terrorist attacks.

An official website was created at www.fs.fed.us/r1/planning/lynx.html, providing information about the proposal, including the information used to develop the Proposed Action.

Open-house meetings were held to provide a better understanding of the lynx proposal and to gain an understanding of public issues and concerns. Most newspapers in the planning area ran stories about the proposal and open-house meetings. Open houses were held in:

- Idaho at Bonners Ferry, Challis, Coeur d'Alene, Coolin, Grangeville, Idaho Falls, Orofino, and Salmon;
- Montana at Billings, Bozeman, Dillon, Great Falls, Hamilton, Helena, Kalispell, Libby, and Missoula; and
- Wyoming at Cody, Jackson Hole, Riverton, and Sheridan.

FS mailed out more than 6,000 letters about the proposal and upcoming meetings to their mailing lists of people interested in land management issues. Input was solicited from individuals and organizations, and from federal, state, and local government agencies interested in or affected by the Proposed Action, as well as from FS employees - see the *Scoping* section in the Project Record.

Tribes with aboriginal territories within the planning area were identified and individual letters written to each of them. The letters asked for their participation and identified local federal contacts.

The governor's office for each state was also contacted about their briefing needs. Discussions were held with the State of Idaho Office of Species Conservation and the Montana Departments of Natural Resources & Conservation and Fish, Wildlife & Parks. The State of Utah considered cooperating agency status, but they decided they would participate on the Lynx and Wolverine Steering Committee instead.

The 1,890 public responses to the scoping notice that were received by December 17, 2001, were evaluated and summarized in a report called *Summary of Public Comments* - see the *Scoping* section of the Project Record. Responses received after December 17, 2001, but before the release of this DEIS were also considered. A summary of these comments is also in the *Scoping* section of the Project Record.

The summary analyzes the public's concerns and thoughts, describing what people said as completely and directly as possible. The system used to analyze public input was designed to be objective, reliable, and easily tracked. Many letters were signed by more than one person, for a total of responses from 2,743 people – individuals, businesses, organizations and agencies. People provided input via letters, e-mail messages, on forms and faxes, and at meetings. More than half the people who responded submitted form letters. One petition was received.

In mid-May 2002, an eight-page update was mailed to the more than 2,000 addresses of the people who responded to the scoping notice.

On August 15, 2002, a Notice of Intent to prepare an Environmental Impact Statement was published in the *Federal Register*, Vol. 67, No. 158, pp. 53334-53335. There were five responses to the Notice of Intent, which also have been considered. The agencies decided to prepare an EIS because of the level of interest expressed during scoping.

The *Scoping* section of the Project Record includes a communication plan, written to make sure no one was overlooked, as well the public involvement documents.

On January 16, 2004, a Notice of Availability of the DEIS for the Northern Rockies Lynx Amendment was published in the *Federal Register*, Vol. 69, No. 11, p. 2619. This notice began a 90-day public comment period. At that time, the agencies also sent copies of the DEIS (either paper or CD versions), or the summary of the DEIS to 71 County Commissions, 31 other Federal Agencies, 16 State Agencies, 19 Tribal Governments, 15 US Representatives and Senators, and 266 organizations and businesses. Also, 100 copies of the DEIS and 1,350 summaries were mailed to individuals who had expressed interest. The documents were also available on the web site:
www.fs.fed.us/r1/planning/lynx.html.

Open-house meetings were held to provide a better understanding of the DEIS and its alternatives. Over 380 people attended the open houses which were held in:

- Idaho at Boise, Challis, Coeur d'Alene, Grangeville, Idaho Falls, Orofino, Priest River, and Salmon;
- Montana at Billings, Bozeman, Dillon, Hamilton, Helena, Libby, and Missoula;
- Wyoming at Afton, Cody, Jackson, Kemmerer, Marbleton, Pinedale, Riverton, Rock Springs, and Sheridan; and
- Utah at Vernal.

Public comments were accepted on the DEIS either sent through the US Mail or via E-mail. The public comment period ended on April 15, 2004, with well over 5,000 comments having been received. Many of those comments were used to help formulate Alternative F, help clarify and add to the analysis, and to correct errors in the DEIS. The Interdisciplinary (ID) team reviewed and responded to all of the comments in Volume 2 and updated this FEIS based on those comments.

Issues & concerns addressed in alternatives

NEPA regulations at 40 CFR 1501.2(c) state federal agencies shall

> *"Study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflict concerning alternative uses of available resources..."*

Accordingly, the scoping process was used to identify conflicts associated with the Proposed Action and to identify issues to use as a basis for developing alternatives. Statements about the effects of the Proposed Action were sorted into *primary issues,* which are discussed below.

Five primary issues were identified. They reflect conflicts between lynx conservation and alternative uses of natural resources. The primary issues were used to develop alternatives to the Proposed Action that meet the Purpose and Need.

Some scoping letters and comments on the DEIS suggested management direction, or other more general ideas, that would have created other alternatives. All comments were reviewed to determine whether or not they warranted further consideration. In the FEIS a section has been added which reviews the relevant risk factors, suggested management direction, management direction considered in detail and management direction not considered in detail. This section combines portions in Chapter 2 of the DEIS.

General criteria for dismissing management direction from detailed study included: (1) direction is not within the authority of FS; (2) direction is already contained in the plans; (3) there was no scientific evidence that indicated management direction is warranted; (4) direction would not meet the Purpose and Need: or (5) the direction is already reflected in an alternative.

While many comments opposed adding management direction to conserve lynx to the existing plans, an additional alternative was not developed to reflect that point of view because it is already reflected in the no-action alternative, Alternative A. Further, the responsible officials could decide to not adopt some of the direction proposed in the action alternatives, Alternatives B, C, D, E, or F.

The following describes the primary issues and indicators that can be used to compare how the action alternatives respond to them. More information can be found in the *Issues* section of the Project Record.

Primary issues

1. Over-the-snow recreation

Issue: What are the effects of limiting the growth of designated over-the-snow routes, on opportunities for over-the-snow recreation?

As discussed in the LCAS (Ruediger et al. 2000, p. 1-2), lynx have evolved a competitive advantage in places with deep, soft snow, where other predators tend to be excluded during mid-winter when prey is most scarce. Snow shoeing, cross-country skiing, and snowmobiling compact snow and may make it possible for competing predators to occupy lynx habitat during winter (LCAS, p. 2-8). On the other hand FWS stated in Federal Register, "... Because no evidence has been provided that packed snowtrails facilitate competition to a level that negatively affects lynx, we do not consider packed snowtrails to be a threat to lynx at this time" (Appendix P, p. 40098).

Standard HU S1 states there can be no net-increase in designated over-the-snow routes in an LAU, unless the increase consolidates use and improves lynx habitat.

Some people said the standard unfairly restricted special-use permits and agreements, because the public could continue to expand their use into areas that are not designated, but people operating under permits or agreements could not expand their use into the same areas.

Issue indicators

- Ability to expand groomed routes
- Ability to expand designated routes
- Effect on over-the-snow winter recreation opportunities

2. Wildland fire risk

Issue: What are the effects of management direction on the risks of wildland fire to communities?

Historically, natural disturbance processes such as fire created and maintained a mosaic of forest stages that provided habitat for both snowshoe hare and lynx (LCAS, p. 2-5).

In August 2000, the President directed the Secretaries of Agriculture and Interior to develop a response to severe wildland fires, to reduce fire impacts on rural communities and to ensure effective firefighting capacity. The result was the National Fire Plan. Congress later directed a 10-Year Comprehensive Strategy be developed to reduce wildland fire risk by improving fire prevention and suppression, reducing hazardous fuels, restoring fire-adapted ecosystems and promoting community assistance (USDA FS 2001a).

In August 2002, President Bush launched the *Healthy Forests Initiative* (HFI) with the intent to reduce the risks severe wildfires pose to people, communities, and the environment.

In December 2003 Congress passed and the President signed the *Healthy Forests Restoration Act (HFRA)*. HFRA provides improved statutory processes for hazardous fuel reduction projects on

certain types of at-risk National Forest System (NFS) and BLM lands and also provides other authorities and direction to help reduce hazardous fuel and restore healthy forest and rangeland conditions on lands of all ownerships.

Objective VEG O3 states fire should be used to restore ecological processes and maintain or improve lynx habitat. However, Standards VEG S1 through VEG S6 could limit or constrain fuel treatments, depending on the situation.

Some people thought the management direction might preclude fuel treatment, especially in the wildland urban interface (WUI).

Issue indicators

- Limits imposed on fuel treatments that reduce winter snowshoe hare habitat
- Limits on fuel treatment outside winter snowshoe hare habitat
- Amount of the 10-year fuel treatment program in lynx habitat that would be unconstrained (standards would not apply)
- Amount of the 10-year fuel treatment program in lynx habitat in the WUI that would be unconstrained (standards would not apply)
- Effect on wildland fire risk

3. Winter snowshoe hare habitat in multistoried forests

Issue: What is the effect on lynx of allowing projects in winter snowshoe hare habitat in multistoried forests?

Winter snowshoe hare habitat can be found in older forests with substantial undergrowth of shrubs and tree branches that snowshoe hares can reach during winter (LCAS, pp. 1-5 to 1-8).

The LCAS, considered the best scientific information available at the time it was written, recognized that older forests with substantial undergrowth were important to lynx, but recommended restricting only precommercial thinning.

The Proposed Action was based on the LCAS. Like the LCAS, it contains measures to protect winter snowshoe hare habitat, including measures restricting precommercial thinning (Standard VEG S6). Recent research in northwest Montana demonstrates that mature forests provide important winter snowshoe hare habitat and are more important than younger stands (J. Squires. pers. com. Oct. 30, 2006).

Other activities, such as prescribed burning, fuel treatment, and timber harvest can reduce foraging habitat in older, multistoried forests. These same activities also can create multistoried conditions or can be used to prolong winter snowshoe hare habitat.

Some people said the management direction should preclude all activities that reduce winter snowshoe hare habitat in multistory forest.

Issue indicators

- Activities allowed in multistoried forests that provide winter snowshoe hare habitat outside wilderness
- Effect on winter snowshoe hare habitat in multistoried forests outside wilderness

4. Precommercial thinning
Issue: What are the effects of limiting precommercial thinning, on restoring tree species and forest structures that are declining?

Dense sapling cover is a major component of winter snowshoe hare habitat – winter hare habitat is important to lynx because the hare is its primary prey (LCAS, p. 1-7). Winter habitat is the most limiting (Ruggiero et al. 2000a). Dense saplings are found:

- In the young regenerating forests that grow up after a major disturbance such as regeneration timber harvest or stand-replacing fire; and
- In older forests with substantial undergrowth of shrubs and short trees that snowshoe hares can reach during winter.

In the northern Rockies, western white pine, whitebark pine, ponderosa pine, quaking aspen, and western larch are all declining (USDA FS 1998). These species all require some level of disturbance to grow into mature trees; historically this disturbance has been fire. Otherwise they get over-topped or shaded from below and the sides, and are out-competed by faster-growing species that are more apt to be killed by fire. See the *Forests* section in Chapter 3 for descriptions of species status.

Lodgepole pine often regenerates densely. In the past, low-intensity fires thinned them out, encouraging some to develop into large, mature trees (Lotan et al. 1985). Forests of large lodgepole pine trees are used by many wildlife species, including goshawk (Shaw 2002).

Standards VEG S5 and VEG S6 put constraints on precommercial thinning in winter snowshoe hare habitat.

Some people said precommercial thinning should continue to be used to restore tree species that are declining or to encourage future large trees.

Issue indicators

- Acres available for precommercial thinning in young regenerating forests to maintain or restore tree species in decline
- Total acres available for precommercial thinning
- Precommercial thinning acres that are deferred by the lynx management direction during the next decade, based on historic average funding of about 34 percent of what is requested
- Effect on tree species in decline

5. FWS Remand Notice
Issue: What level of management direction should be applied to activities that the FWS remand notice found were not a threat to lynx populations?

On July 3, 2003, the FWS issued a *Notice of Remanded Determination of Status for the Contiguous United States Distinct Population Segment of the Canada Lynx* (Appendix P). The notice revisited the five factors used to determine whether lynx should be listed as threatened or endangered, and reassessed the magnitude of threats to lynx. The notice said lynx is not endangered throughout a significant portion of its

range, reaffirming the decision to list lynx as threatened.

The notice said that, for several risk factors identified in the LCAS, the FWS has no information to indicate they are a threat to lynx at this time. "The risks identified in the LCAS are based on effects on either individual lynx, populations, both, or lynx habitat. Therefore, not all of the risks identified in the LCAS threaten lynx populations in the United States" (p. 40096). The notice specifically discussed several of the risk factors addressed in the Proposed Action:

- "Mining and grazing were not specifically addressed because we have no information to indicate they pose threats to lynx." (p. 40083)
- "… lynx show no evidence of being displaced by or avoidance of unpaved forest roads. We find no information demonstrating that forest roads negatively impact lynx (Roe et al. 2001) and, therefore do not consider forest roads to be a threat to lynx." (p. 40097)
- "There continues to be no data on the role of competition between lynx and other species … At this time there is no evidence that, if competition exists between lynx and any of these species, it exerts a population-level impact on lynx; therefore we do not consider competition to be a threat to lynx." (p. 40097)
- "… Because no evidence has been provided that packed snowtrails facilitate competition to a level that negatively affects lynx, we do not consider packed snowtrails to be a threat to lynx at this time." (p. 40098)

The notice raises questions about whether the management direction should apply only to activities that threaten lynx populations.

Issue indicators

- Nature of management direction applied to grazing, minerals, roads, and over-the-snow recreation.

Range of alternatives

NEPA regulations at 40 CFR 1502.14(a) say an environmental impact statement must

> *...rigorously explore and objectively evaluate all reasonable alternatives, and for alternatives which were eliminated from detailed study, briefly discuss the reasons ...*

The courts have established that this does not mean every conceivable alternative must be considered, but that the selection and discussion of alternatives must permit a reasoned choice and foster informed public participation and decision-making.

Whether an alternative is *reasonable* is primarily determined by whether it meets the Purpose and Need and whether it represents a distinctly different approach in responding to issues.

The range of alternatives presented in this chapter was determined by evaluating the public letters sent during the scoping period, the comments on the DEIS, and the Purpose and Need. The level of scientific information available on lynx and lynx habitat, the Listing Decision (Appendix O), the Remand Notice (Appendix P), and ESA requirements were also considered.

Within these parameters, the alternatives developed display a reasonable range to guide future projects, respond to the issues, and to meet the Purpose and Need.

When the alternatives were being developed, suggested objectives, standards, and guidelines were considered if they addressed the primary issues or management concerns. These comments were screened to see if:

- They met the Purpose and Need, and, if so, whether
- They provided approaches different from those already included in other alternatives.

Those that did not meet both tests are discussed later in this chapter as *Management direction considered.* In the discussion the reasons why some comments with suggested direction were not developed further are explained. These comments with their partially developed management direction were reviewed and weighed by the deciding officials during the course of the process. Therefore, they contribute to the range of reasonable alternatives and a reasoned choice, even though they were eliminated from further consideration.

Alternatives developed in detail

Alternative A, no action

Analyzing a no-action alternative is a requirement of NEPA at 40 CFR 1508.14(d), and of FS planning procedures. In this case, no action means no change, no amendment to the already existing plans. This analysis considers the effects of the existing plans as they currently exist, including any previous amendments.

The no-action alternative does not include the conservation measures in the LCAS. While the FS has been following the Conservation Agreements we signed with the FWS and considering the LCAS when evaluating projects, the LCAS measures have not been incorporated as plan direction. A decision to adopt Alternative A would not adopt the measures of the LCAS, but also would not void the Conservation Agreements or the requirements of ESA.

The comparison of alternatives focuses on the changes in effects that result from adding lynx management direction to the plans. The proposed measures are considered individually, as well as collectively. They may be selected individually or not. A decision to <u>not</u> adopt some of the lynx management direction would be a decision to select part of Alternative A.

Alternative B, the Proposed Action

The Proposed Action was developed from conservation measures recommended in the LCAS. Appendix A is a crosswalk from the LCAS, to the proposal as written in the scoping letter, and the Proposed Action, Alternative B, found in the Draft and Final EISs.

Alternative B addresses activities on NFS lands that can affect lynx and their habitat. The exact language of the goal, objectives, standards, and guidelines for Alternative B and all the other action alternatives can be found in Table 2-1.

Timber and wildland fire management

Timber and wildland fire management both can affect the amount and quality of winter snowshoe hare and denning habitat (LCAS, pp. 2-2 to 2-6). Alternative B would add management direction to provide certain habitat conditions (see the *Lynx* section in Chapter 3 of this EIS for a more thorough description and explanation of stand conditions).

Objectives describe desired conditions.

- Objectives VEG O1 and VEG O3 focus on using fire and timber management to emulate historic processes.

- Objective VEG O2 says winter snowshoe hare habitat should be near denning habitat.
- Objectives VEG O3 and VEG O4 encourage using fire and timber management to develop winter snowshoe hare habitat.

Standards set sideboards for projects. The vegetation standards do not apply to fire suppression or to *wildland fire use.*

- Standard VEG S1 limits to 30 percent in an LAU, the amount of lynx habitat that can be in an unsuitable condition. *Unsuitable lynx habitat* is young regenerating forests where the trees are generally less than ten to 30 years old and the vegetation has not yet grown tall enough to support snowshoe hares during all seasons. It would grow into winter snowshoe hare habitat over time.

  Standard VEG S1 is meant to ensure lynx habitat is maintained at the scale of a lynx home range. Standard VEG S1 is based on general information about historic conditions (Brittel et al. 1989) and would not apply if a broadscale assessment substantiated different historical levels. The amount of lynx habitat in an unsuitable condition on private lands within the LAU is considered in this standard.

- Standard VEG S2 limits to 15 percent in ten years the amount of lynx habitat in an LAU that can be made unsuitable because of timber harvest. Timber harvest is not an exact ecological substitute for natural disturbance processes (LCAS, p. 2-2 to 2-3). Limiting the amount of timber harvest would let natural disturbance processes – fire and insect and diseases – play their historic roles producing unsuitable habitat, and later, foraging conditions.

- Standards VEG S3 and VEG S4 direct maintaining denning habitat and limiting salvage harvest that may remove potential denning sites.

- Standards VEG S5 and VEG S6 limit precommercial thinning so existing winter snowshoe hare habitat would be maintained. Thinning would be allowed for safety and protecting property.

Guidelines identify ways to meet the objectives.

- Guideline VEG G1 encourages managers to create winter snowshoe hare habitat where it is lacking.

- Guidelines VEG G2 and VEG G3 say providing denning habitat close to foraging habitat should be considered when designing timber and fire projects.

- Guideline VEG G4 says the result of prescribed fire or wildland fire use should not be new trails that lead to more snow compaction or

permanent firebreaks built on ridges and saddles.

- Guideline VEG G5 says habitat for red squirrels should be provided.

Livestock grazing
According to the LCAS (pp. 2-13 to 2-14), livestock grazing may reduce winter snowshoe hare habitat especially where young riparian forests or stands of aspen are regenerating. Livestock grazing also may reduce shrub-steppe habitat, which provides cover and prey for lynx when they are traveling. In the Remand Notice (Appendix P) the FWS stated they have no information to indicate grazing poses a threat to lynx.

- Objective GRAZ O1 says grazing should be managed in a way that maintains or improves lynx habitat.
- Standard GRAZ S1 says to make sure shrubs and trees can re-grow.
- Standard GRAZ S2 says to make sure aspen can survive.
- Standards GRAZ S3 and GRAZ S4 say livestock grazing is to be managed in a manner to emulate historic conditions in riparian areas and shrub-steppe habitats.

Human uses
Recreational use, forest backcountry roads and trails, and other human developments may reduce lynx habitat connectivity, or by compacting snow, provide a way for competing predators to move into lynx habitat (LCAS, pp. 2-6 to 2-13).

- Objective HU O1 and Guideline HU G4 say to discourage new snow-compacting activities in lynx habitat.
- Objectives HU O2, HU O4, and HU O5, and Guidelines HU G1, HU G2, HU G3, and HU G5 say to provide lynx habitat in association with human uses and developments.
- Objectives HU O2, HU O3, HU O4, HU O5, and HU O6, and Guidelines HU G2, HU G3, HU G6, HU G7, HU G8, and HU G9 say to maintain lynx habitat connectivity.
- Standard HU S1 would stop the agencies from encouraging snow-compacting recreation in new areas, but would not limit existing use.
- Standard HU S2 says ski area expansions shall provide diurnal security habitat.
- Standard HU S3 limits winter access for special uses other than recreation, and for mineral and energy exploration and development.

Highways and private land developments
Highways and private land developments may affect lynx mortality or habitat connectivity (LCAS, pp. 2-17 to 2-19). The following direction applies only to

the FS, but encourages cooperation with others.

- Objectives ALL O1 and LINK O1 say to provide lynx habitat connectivity.
- Objective LINK O1 says to work with other landowners.
- Standard ALL S1 says to make sure developments and vegetative management projects provide connectivity.
- Standard LINK S1 says to identify highway crossings.
- Standard LINK S2 says to manage shrub-steppe habitats to contribute to maintaining or achieving mid- or late-seral stages.
- Guideline ALL G1 says highway-crossing structures and fencing should be used to avoid or reduce effects on lynx.
- Guideline LINK G1 says NFS lands should be retained in public ownership.

Lynx Analysis Units

- Standard LAU S1 says LAU boundaries would not be adjusted except through agreement with the FWS, based on new information about lynx habitat.

Monitoring

- Map the location and amount of snow-compacting use that coincided with lynx habitat in LAUs during the 1998-2000 seasons for designated over-the-snow and groomed routes and areas, and areas of consistent snow compaction. Such activities include snowmobiling, snowshoeing, cross-country skiing, dog sledding, etc.

Alternative C

Alternative C was designed to respond to issues of over-the-snow recreation management and winter snowshoe hare habitat in multistoried forests, while providing a comparable level of protection to lynx as Alternative B, the Proposed Action.

Alternative C expands the area to consider several of the standards from an LAU to multiple LAUs and provides additional management direction for multistoried forests.

The **changes** from Alternative B are:

- Standard VEG S1 was changed to increase the scale at which it is applied. Alternative C would apply the 30 percent standard either to an LAU or to a fixed combination of adjacent LAUs, so disturbance processes such as fire could be factored in. Under Alternative C, the standard would not limit the use of prescribed fire.
- Standard VEG S2 was changed to a guideline (see VEG G6). While the agencies must comply with a standard, they may deviate from

a guideline. Analysis indicated that timber harvest has caused very few LAUs to exceed 15 percent unsuitable (Hillis et al. 2003). Some people thought timber harvest should not be singled out since unsuitable conditions can be created by prescribed fire as well.

- Standard VEG S4 was changed to allow salvage logging in disturbed areas smaller than five acres, when such areas are within 200 feet of dwellings and outbuildings. This would let commercial operators clear dead or dying trees to treat fuels.
- Standards VEG S5 and VEG S6 were changed to apply to all vegetation management, not just precommercial thinning, and to allow research projects and genetic tests. The LCAS did not say to limit all activities that could reduce winter snowshoe hare habitat in multistoried stands.
- Guideline VEG G1 was changed to give priority to managing vegetation in mid-aged or mature forests that have little understory or few dead trees. Analysis indicates an abundance of this kind of forest in the planning area, and it is of relatively low value to lynx.
- Guideline VEG G6 was a standard under Alternative B. The guideline states timber management project should not change more than 15 percent of the lynx habitat in an LAU into an unsuitable condition during a ten-year period.
- Standard HU S1 was changed to increase the scale at which it would be applied to consolidate use and improve lynx habitat. The no-net-increase standard for groomed or designated routes would be applied either to an LAU or to a fixed combination of immediately adjacent LAUs.

  Standard HU S1 also was changed to let groomed or designated trails expand into areas or routes where snow was already compacted, as identified in the baseline of 1998 through 2000. This would allow increased use where snow is already compacted.
- Standard HU S2 was changed to a guideline (see HU G10). Not all ski areas need to provide diurnal security habitat; it can be provided next to ski areas, not just inside them.
- Guideline HU G6 changed its emphasis from *avoiding* to *mitigating* upgrading roads, where upgrades would lead to substantial increases in traffic volumes or speeds. Some upgrades may be proposed to reduce dust or to ensure safety and reduce maintenance.

- Guideline HU G10 states when developing or expanding ski area and trails, access road and lift termini should be located to maintain and provide lynx diurnal security habitat.

Alternative D

Alternative D was designed to address the issues of managing over-the-snow recreation and multistoried forests, similar to Alternative C. Alternative D also addresses the issue about precommercial thinning by allowing some precommercial thinning in winter snowshoe hare habitat. The **changes** from Alternative B are:

- Standard ALL S2 was added which would allow any project to go forward if it deviates from a lynx standard with a "not likely to adversely affect" determination, subject to ESA requirements and to review by the FS Regional Forester.
- Standard VEG S1 was changed to further increase the scale at which it is applied. Alternative D would apply the 30 percent standard at the scale of a sub-basin or an isolated mountain range.
- Standard VEG S2 was dropped.
- Standard VEG S3, deferring vegetation management where less than ten percent denning habitat was available, was changed to allow projects if they leave enough standing trees and large down woody material for den sites.
- Standard VEG S4 was changed to Guideline VEG G7 that says salvage logging should be limited after a disturbance kills trees in areas of five acres or less. Leaving small dead patches should be considered if less than ten percent denning habitat is available in an LAU.
- Standards VEG S5 and VEG S6 were changed to apply to all vegetation management, not just precommercial thinning. Thinning would be allowed in the same cases as Alternative C, plus thinning could be done to favor certain tree species.

  In young regenerating forests, *daylight thinning* could take place around western larch, ponderosa pine and planted western white pine if 80 percent of the cover was retained. This would retain some of the value as snowshoe hare cover and forage, and give these disturbance-adapted species a better chance to grow into large mature trees. VEG S5 would let aspen restoration projects take place in young regenerating forests.

  Both standards would allow whitebark pine restoration projects, including thinning and prescribed burning. Both would allow thinning anywhere there is

already an abundance of snowshoe hare forage, and projects that would encourage lodgepole pine to develop old-growth characteristics.

Standard VEG S6 would permit some short-term reduction of foraging habitat in older stands, allowing logging or prescribed fire to create openings that would improve or maintain foraging habitat in the long term.

- Guideline VEG G1 was changed in Alternative D as it was in Alternative C. It gives priority to managing vegetation in mid-aged or mature forests that have little understory or few dead trees. Analysis indicates an abundance of this kind of forest in the planning area, and it is of relatively low value to lynx.
- Guideline VEG G2 was dropped as a separate item. It is included as part of Standard VEG S3.
- Guideline VEG G7 states after a disturbance kills trees in areas of five acres or smaller, which could contribute to lynx denning habitat, salvage harvest should not occur unless at least ten percent denning habitat in an LAU is retained and well distributed.
- Standard HU S1 was changed in Alternative D as it was in Alternative C, to increase the scale at which it would be applied to consolidate use and improve lynx habitat. The no-net-increase standard for groomed or designated routes would be applied either to an LAU or to a fixed combination of immediately adjacent LAUs.

  Standard HU S1 also was changed to let groomed or designated trails expand into areas or routes where snow was already compacted, as identified in the baseline of 1998 through 2000. This would allow increased use where snow is already compacted.
- Standard HU S2 was changed to a guideline (see HU G10). Not all ski areas need to provide diurnal security habitat; it can be provided next to ski areas, not just inside them.
- Guideline HU G6 was changed in Alternative D as it was changed in Alternative C. Guideline HU G6 changed its emphasis from *avoiding* to *mitigating* upgrading roads, where upgrades would lead to substantial increases in traffic volumes or speeds. Some upgrades may be proposed to reduce dust or to ensure safety and reduce maintenance.
- Guideline HU G10 states when developing or expanding ski area and trails, access road and lift termini should be located to maintain and provide lynx diurnal security habitat.

- Two monitoring items were added to Alternative D along with the monitoring that is found in Alternative B.

  They are: 1) Annually monitor the acres of vegetation management projects that occurred in lynx habitat and in winter snowshoe hare habitat during the previous fiscal year; and 2) Document and evaluate the conditions under which Standard ALL S2 is applied.

Alternative E

Alternative E addresses the issue of wildland fire risk. The vegetation standards would not apply to fuel treatment projects developed in a collaborative manner. Alternative E also responds to statements made in the Remand Notice (Appendix P) that FWS has no information to indicate that grazing or snow compaction is a threat to lynx at this time.

The **changes** from Alternative B are:

- As with Alternative D, Standard ALL S2 was added that would allow a project to go forward if it deviates from a lynx standard with a "not likely to adversely affect" determination, subject to ESA requirements. Under Alternative E, the standard would allow a project to go forward if it deviates from a lynx standard and results in short-term adverse effects, but has long-term beneficial effects on lynx. No higher level of review would be required.
- Standard VEG S1 was changed to increase the scale at which it is applied. As with Alternative C, Alternative E would apply the 30 percent standard either to an LAU or a fixed combination of adjacent LAUs. Under Alternative E, the standard does not apply to fuel treatments developed in a collaborative manner, as described in the *10-Year Comprehensive Strategy Implementation Plan* (USDA FS 2001a).
- Standard VEG S2 was dropped, the same as under Alternative D.
- Standard VEG S3 was changed, as in Alternative D, to allow projects where less than ten percent denning habitat is available if enough standing trees or large down woody material is left for den sites. Under Alternative E, the standard does not apply to fuel treatments developed in a collaborative manner, as described in the *10-Year Comprehensive Strategy Implementation Plan.*
- Standard VEG S4 was changed as in Alternative D, to Guideline VEG G7 that says salvage logging should be limited after a disturbance kills trees in areas of five acres or less. Leaving small dead patches should be considered if less than ten

percent denning habitat is available in an LAU.

- Standard VEG S5 would apply only to precommercial thinning, as in Alternative B. Under Alternative E, the standard would also allow fuel treatments projects that use precommercial thinning and were developed in a collaborative manner, as described in the *10-Year Comprehensive Strategy Implementation Plan.*
- Standard VEG S6 was dropped. The management direction was changed to Guideline VEG G8.
- Guideline VEG G1 was changed in Alternative E as it was in Alternative C. It gives priority to managing vegetation in mid-aged or mature forests that have little understory or few dead trees. Analysis indicates an abundance of this kind of forest in the planning area, and it is of relatively low value to lynx.
- Guideline VEG G2 was dropped as a separate item. It is included as part of Standard VEG S3.
- Guideline VEG G7 states after a disturbance kills trees in areas of five acres or smaller, which could contribute to lynx denning habitat, salvage harvest should not occur unless at least ten percent denning habitat in an LAU is retained and well distributed.
- Guideline VEG G8 states vegetation management projects should provide habitat conditions through time that maintain winter snowshoe hare habitat during the understory reinitiation or old-multistory structural stages. Vegetation management projects should be use to improve lynx habitat where dense understories are lacking.
- Standards GRAZ S1, S2, S3, and S4 were dropped and the management direction included in Guidelines GRAZ G1, G2, G3, and G4.
- Guideline GRAZ G1 says livestock grazing should be managed so that shrubs and trees can re-grow in openings.
- Guideline GRAZ G2 says livestock grazing should be managed to contribute to heath and sustainability of aspen stands.
- Guidelines GRAZ G3 and GRAZ G4 say livestock grazing should be managed in a manner to emulate historic conditions in riparian areas and shrub-steppe habitats.
- Standard HU S1 was dropped and the management direction included as Guideline HU G11.
- Standard HU S2 was dropped and the management direction included as Guideline HU G6.

- Standard HU S3 was dropped and the management direction included as Guideline HU G12.
- Guideline HU G6 changed its emphasis from *avoiding* to *mitigating* upgrading roads, where upgrades would lead to substantial increases in traffic volumes or speeds. Some upgrades may be proposed to reduce dust or to ensure safety and reduce maintenance.
- Guideline HU G10 states when developing or expanding ski area and trails, access road and lift termini should be located to maintain and provide lynx diurnal security habitat.
- Guideline HU G11 states designated over-the-snow routes or play areas should not expand outside baseline areas of consistent snow compaction by LAU or in a combination of immediately adjacent LAUs, unless designation serves to consolidate use and improve lynx habitat.
- Guideline HU G12 states winter access for non-recreation special uses, and mineral and energy exploration and development, should be limited to designated routes or designated over-the-snow routes.
- Standard LINK S2 was dropped and the management direction included in Guideline LINK G2.
- Guideline LINK G2 states livestock grazing in shrub-steppe habitats should be managed to contribute to maintaining or achieving a preponderance of mid- or late-seral stages, similar to conditions that would have occurred under historic disturbance regimes.
- Two monitoring items were added to Alternative E along with the monitoring that is found in Alternative B. They are: 1) Annually monitor the acres of vegetation management projects that occurred in lynx habitat and in winter snowshoe hare habitat during the previous fiscal year; and; 2) Document and evaluate the conditions under which Standard ALL S2 is applied.

Alternative F, FEIS Preferred Alternative

Appendix N identifies the management direction applicable to Alternative F, the FEIS Preferred Alternative.

Alternative F was developed from public comments on the DEIS and by pulling together parts of the other alternatives. Since it was developed from the other alternatives, the effects of Alternative F is within the scope of the effects of the alternatives analyzed in the DEIS.

Alternative F addresses comments about where to apply the management direction. Many comments suggested the management direction should only

be applied to occupied habitat. Therefore, Alternative F is evaluated under two scenarios: (1) management direction would be incorporated into all forest plans and would *apply to all mapped lynx habitat,* whether or not occupied; and (2) management direction would be incorporated into all forest plans but would only *apply to occupied habitat.* Under scenario 2, the direction would be "considered" for unoccupied units, but would not have to be followed until such time as lynx occupy the unit. The Nez Perce, Salmon-Challis, Beaverhead-Deerlodge, Bitterroot, Ashley and Bighorn NFs, and the disjunct mountain ranges on the Custer, Gallatin, Helena and Lewis and Clark NFs are unoccupied based on the best scientific information available at this time (USDA FS, USDI FWS 2006a).

Alternative F addresses many comments about problems and concerns with Alternatives E, the DEIS preferred alternative. In particular many people and FWS felt Alternative E would not meet the purpose and need because it did not provide the regulatory mechanisms to adequately address lynx needs.

Alternative F was designed to provide adequate regulatory mechanisms for those risk factors found to be a threat to lynx populations - specifically those factors related to the quantity and quality of lynx habitat as discussed in the section *Management direction considered.*

In addition, Alternative F addresses all the primary issues to some degree by:

- addressing over-the-snow recreation in a similar fashion as the other alternatives;
- providing additional protection to multistoried winter snowshoe hare habitat than what is described in Alternative B;
- allowing some fuel treatment projects to be unconstrained by the vegetation standards, but providing additional sideboards from Alternative E on where and to what degree;
- allowing a limited amount of precommercial thinning to restore tree species in decline; and
- responding to statements in the Remand Notice which indicated there is no information to indicate grazing or snow compaction are threats to lynx at this time.

For those risk factors found to be a threat to lynx populations' management direction is in the form of standards and would apply to individual LAUs. For risk factors found to be threat only to individuals, management direction is in the form of guidelines.

The **changes** from Alternative B are:

- Objectives VEG O1, O2 and O4 were modified for clarity.
- Objective VEG O1 states manage vegetation to mimic or approximate natural succession and disturbance processes while maintaining habitat components necessary for the conservation of lynx.
- Objective VEG O2 states provide a mosaic of habitat conditions through time that support dense horizontal cover, and high densities of snowshoe hare. Provide winter snowshoe hare habitat in both the stand initiation structural stage and in mature, multi-story conifer vegetation.
- Objective VEG O4 states focus vegetation management in areas that have potential to improve winter snowshoe hare habitat but presently have poorly developed understories that lack dense horizontal cover.
- Standard VEG S1 was modified to clarify the type of vegetation treatment it applies to (activities that regenerate) and clarify what is "unsuitable" habitat (habitat which is in the stand initiation structural stage that is too short to provide winter snowshoe hare habitat).
- In addition, Standard VEG S1 was modified so it would not apply to *fuel treatments projects within the WUI as defined by HFRA within sideboards.*
- Fuel treatment projects within the WUI that do not meet this standard can proceed, however a cumulative total of fuel treatment projects that do not meet VEG Standards S1, S2, S5, and S6 shall not exceed six percent of mapped lynx habitat on each Forest.

  Fuel treatment projects that create stand initiation structural stage would be included in the 30 percent calculation addressed here in VEG S1. This means if a fuel treatment project within the WUI creates more than 30 percent, then other projects that want to regenerate more would have to be modified or deferred until the standard can be met.
- Standard VEG S2 was modified to describe the type of timber harvest projects it applies to (regeneration harvest).

  In addition, it was modified so it would not apply to *fuel treatment projects within the WUI as defined by HFRA within sideboards.*

  Fuel treatment projects within the WUI that do not meet this standard can proceed, however a cumulative total of fuel treatment projects that do not meet VEG Standards S1, S2, S5, and S6 shall not exceed six percent of mapped lynx habitat on each Forest.

- Denning habitat direction found in Standards VEG S3, VEG S4 and Guidelines VEG G2 and VEG G3 were combined into one, Guideline VEG G11. It states denning habitat should be distributed in each LAU in the form of pockets of large amounts of large woody debris, either down logs or root wads, or large piles of small wind thrown trees ("jack-strawed" piles). If denning habitat appears to be lacking in the LAU, then projects should be designed to retain some coarse woody debris, piles, or residual trees to provide denning habitat in the future.
- Standard VEG S5 would allow some precommercial thinning to occur for aspen and whitebark pine; for daylight thinning of planted rust-resistant white pine where 80 percent of the winter snowshoe hare habitat is retained and for research studies or genetic tree tests evaluating genetically improved reforestation stock. In addition Standard VEG S5 was modified to allow for incorporation of new information, it says:

  1. Based on new information that is peer reviewed and accepted by the regional level of the FS and state level of FWS, where a written determination states:

     a. that a project is not likely to adversely affect lynx; or

     b. that a project is likely to have short term adverse effects on lynx or its habitat, but would result in long-term benefits to lynx and its habitat.

- In addition Standard VEG S5 would not apply to fuel treatment projects that use precommercial thinning as a tool within the WUI as defined by HFRA. The cumulative total of fuel treatment projects that do not meet Standards VEG S1, S2, S5, and S6 shall not exceed 6 percent of mapped lynx habitat on each Forest.
- Standard VEG S6, management direction for multistoried forests, was modified to apply to all vegetation management projects. The standard also recognizes vegetation management can be used to improved habitat condition.

  Standard VEG S6 would not apply to fuel treatment projects within the WUI as defined by HFRA, within sideboards. Cumulative total of fuel treatment projects that do not meet Standards VEG S1, S2, S5, and S6 shall not exceed six percent of mapped lynx habitat on each Forest.
- Guideline VEG G1 was modified to clarify where it would be desirable treat vegetation and for what objective.

- Guideline VEG G4 states prescribed fire activities should not create permanent travel routes that facilitate snow compaction. Constructing permanent firebreaks on ridges or saddles should be avoided.
- Guideline VEG G10 states fuel treatment projects within the WUI as defined by HFRA should be designed considering Standards VEG S1, S2, S5, and S6 to promote lynx conservation.
- Standards GRAZ S1, S2, S3, and S4 were dropped and similar management direction provided in the form of guidelines (Guidelines GRAZ G1, G2, G3, and G4).
- Objective HU O5 was reworded for clarity.
- Standard HU S1 was dropped and the management direction included as Guideline HU G11.
- Standard HU S2 was dropped and the management direction included as Guideline HU G10.
- Standard HU S3 was dropped and the management direction included as Guideline HU G12.
- Guideline HU G2 wording was changed from *nocturnal foraging* to *lynx foraging habitat.*
- Guideline HU G6 changed its emphasis from *avoiding* to *mitigating* upgrading roads, where upgrades would lead to substantial increases in traffic volumes or speeds. Some upgrades may be proposed to reduce dust or to ensure safety and reduce maintenance.
- Guideline HU G10 states when developing or expanding ski areas and trails, consider locating access roads and lift termini to maintain and provide lynx security habitat if it has been identified as a need.
- Guideline HU G11 states designated over-the-snow routes, or designated play areas, should not expand outside baseline areas of consistent snow compaction, unless designation serves to consolidate use and improve lynx habitat. This may be calculated on an LAU basis, or on a combination of immediately adjacent LAUs. Use the same analysis boundaries for all actions subject to this guideline.

  This does not apply inside permitted ski area boundaries, to winter logging, to rerouting trails for public safety, to accessing private inholdings, or to access regulated by Guideline HU G12.
- Guideline HU G12 states winter access for non-recreation special uses, and mineral and energy exploration and development, should be limited to designated routes or designated over-the-snow routes.

- Standard LINK S2 was dropped and the management direction included as Guideline LINK G2.
- Guideline LINK G2 states livestock grazing in shrub-steppe habitats should be managed to contribute to maintaining or achieving a preponderance of mid- or late-seral stages, similar to conditions that would have occurred under historic disturbance regimes.
- Standard ALL S1. Wording is added that makes it clear the standard applies only in an LAU or in a linkage area.
- Standard LAU S1 says changes in LAU boundaries shall be based on site-specific habitat information and after review by the Forest Service Regional Office.
- The original monitoring item from Alternative B was rephrased to say: Map the location and intensity of snow compacting activities, and designated and groomed routes that occurred inside LAUs during the period of 1998 to 2000. The mapping is to be completed within one year of this decision, and changes in activities and routes are to be monitored every five year after the decision.
- Two other monitoring items were added in Alternative F. They are:

1. Annually report the number of acres where any of the exemptions 1 through 6 listed in Standard VEG S5 were applied. Report the type of activity, the number of area, and the location (by unit and LAU); and
2. Report the acres of fuel treatment in lynx habitat within the WUI, as defined by HFRA, when the project decision is approved. Report whether or not the fuel treatment met the vegetation standards. If standard(s) are not met, report which standard(s) are not met, why they were not met, and how many acres were affected.

Table 2-1, starting on the following page, compares the five action alternatives, Alternatives B, C, D, E, and F so differences and similarities among their various objectives, standards, and guidelines can be readily compared. Alternative A is not included on Table 2-1 since there are no lynx goals, objectives, standards, or guidelines in the No-Action Alternative to compare to the other alternatives.

Table 2-1. Crosswalk between Alternative B (the Proposed Action) and the other action alternatives: C, D, E & F

Differences between the alternatives have been *italicized.*

If a conflict exists between this management direction and an existing plan, the more restrictive direction applies.

Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Goal[14] Conserve Canada lynx.	Same as Alt B	Same as Alt B	Same as Alt B	Same as Alt B
ALL MANAGEMENT PRACTICES AND ACTIVITIES (ALL). *The following objectives, standards, and guidelines apply to all management projects in lynx habitat in lynx analysis units (LAUs) and in linkage areas, subject to valid existing rights. They do not apply to wildfire suppression, or to wildland fire use. They do not apply to wildfire suppression, or to wildland fire use.*				
Objective[30] ALL O1 Maintain[26] or restore[40] lynx habitat[23] connectivity[16] in and between LAUs[21], and in linkage areas[22].	Same as Alt B	Same as Alt B	Same as Alt B	Same as Alt B
Standard[44] ALL S1 New or expanded permanent developments[33] and vegetation management[49] projects[36] must maintain[26] habitat connectivity[16].	Same as Alt B	Same as Alt B	Same as Alt B	Standard[44] ALL S1 New or expanded permanent developments[33] and vegetation management[49] projects[36] must maintain[26] habitat connectivity[16] *in an LAU[21] and/or linkage area[22].*
Standard ALL S2 None	None	A project[36] proposal that deviates from one or more lynx standards may proceed without amending the plan, subject to ESA requirements, if a written determination is made that the project is not likely to adversely affect lynx. The regional forester must approve any project proposed under this measure before the decision is made.	A project[36] proposal that deviates from one or more lynx standards may proceed without amending the plan, subject to ESA requirements, *either:* *1.* If a written determination is made that the project[36] is not likely to adversely affect lynx; or 2. *If it may result in short-term adverse effects on lynx but if long-term benefits to lynx and its habitat would result.*	*None*

Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Guideline[15] ALL G1 Methods to avoid or reduce effects on lynx should be used when constructing or reconstructing highways[18] or forest highways[12] across federal land. Methods could include fencing, underpasses, or overpasses.	Same as Alt B	Same as Alt B	Same as Alt B	Same as Alt B
Standard[44] LAU S1 LAU[21] boundaries will not be adjusted except through agreement with the FWS, based on new information about lynx habitat[23].	Same as Alt B	Same as Alt B	Same as Alt B	Standard[44] LAU S1 *Changes in LAU[21] boundaries shall be based on site-specific habitat information and after review by the Forest Service Regional Office.*
VEGETATION MANAGEMENT ACTIVITIES AND PROJECTS (VEG): *The following objectives, standards, and guidelines apply to vegetation management projects in lynx habitat within lynx analysis units (LAUs). With the exception of Objective VEG O3 that specifically concerns wildland fire use, the objectives, standards, and guidelines do not apply to wildfire suppression, wildland fire use, or removal of vegetation for permanent developments such as mineral operations, ski runs, roads, and the like. None of the objectives, standards, or guidelines apply to linkage areas.*				
Objective[30] VEG O1 Manage vegetation to be more similar to historic succession and disturbance processes while maintaining habitat components necessary for the conservation of lynx.	Same as Alt B	Same as Alt B	Same as Alt B	Objective [30] VEG O1 Manage vegetation[49] to *mimic or approximate natural* succession and disturbance processes while maintaining habitat components necessary for the conservation of lynx.
Objective VEG O2 Maintain or improve lynx habitat[23], emphasizing high-quality winter snowshoe hare habitat[51] near denning habitat[6].	Same as Alt B	Same as Alt B	Same as Alt B	Objective VEG O2 *Provide a mosaic of habitat conditions through time that support dense horizontal cover[19], and high densities of snowshoe hare. Provide*

Table 2-1 Alternatives

Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
				winter snowshoe hare habitat[51] in both the stand initiation structural stage and in mature, multi-story conifer vegetation.
Objective VEG O3 Conduct fire use[11] activities to restore[40] ecological processes and maintain or improve lynx habitat.	Same as Alt B	Same as Alt B	Same as Alt B	Same as Alt B
Objective VEG O4 Design regeneration harvest[38], reforestation, and thinning to develop characteristics suitable for winter snowshoe hare habitat.	Same as Alt B	Same as Alt B	Same as Alt B	Objective VEG O4 *Focus vegetation management[49] in areas that have potential to improve winter snowshoe hare habitat[51] but presently have poorly developed understories that lack dense horizontal cover.*
Standard[44] VEG S1 Unless a broad scale assessment[2] has been completed that substantiates different historic levels of unsuitable habitat[24], limit disturbance in each LAU[21] as follows: If more than 30 percent of the lynx habitat[23] in an LAU is currently in unsuitable condition, no additional habitat may be made unsuitable by vegetation management[49] projects[36].	Standard VEG S1 Unless a broad scale assessment has been completed that substantiates different historic levels of unsuitable habitat, limit disturbance in each LAU *or in a combination of immediately adjacent LAUs* as follows: If more than 30 percent of the lynx habitat in an LAU *or a combination of immediately adjacent LAUs* is currently in unsuitable condition, no additional habitat may be made unsuitable by vegetation management projects[36].	Standard VEG S1 Unless a broad scale assessment has been completed that substantiates different historic levels of unsuitable habitat, limit disturbance in *each sub-basin or isolated mountain range[20]* as follows: If more than 30 percent of the lynx habitat *in a sub-basin or isolated mountain range* is currently in unsuitable condition, no additional habitat may be made unsuitable by vegetation management projects[36]. Use the same analysis	Standard VEG S1 Unless a broad scale assessment has been completed that substantiates different historic levels of unsuitable habitat, limit disturbance in each LAU *or in a combination of immediately adjacent LAUs* as follows: If more than 30 percent of the lynx habitat in an LAU *or a combination of immediately adjacent LAUs* is currently in unsuitable condition, no additional habitat may be made unsuitable by vegetation management	Standard[44] VEG S1 *Standard VEG S1 applies to all vegetation management[49] projects[36] that regenerate[38] forests, except for fuel treatment[13] projects[36] within the wildland urban interface (WUI)[50] as defined by HFRA[17], subject to the following limitation:* *Fuel treatment projects[36] within the WUI[50] that do not meet Standards VEG S1, VEG S2, VEG S5, and VEG S6 may occur on no more than 6 percent*

Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
	This standard does not apply to prescribed fire[34]. *Use the same analysis boundaries for all vegetation management projects[36] subject to this standard.*	boundaries for all vegetation management projects[36] subject to this standard.	projects[36]. *This standard does not apply to fuel treatment[13] projects[36] identified through processes such as that described in <u>A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment 10-Year Comprehensive Strategy Implementation Plan</u>.* Use the same analysis boundaries for all vegetation management projects[36] subject to this standard.	*(cumulatively) of lynx habitat on each administrative unit (a unit is a National Forest). For fuel treatment projects[36] within the WUI[50] see guideline VEG G10.* Unless a broad scale assessment has been completed that substantiates different historic levels of stand initiation structural stages[45] limit disturbance in each LAU as follows: If more than 30 percent of the lynx habitat in an LAU is currently in a *stand initiation structural stage that does not yet provide winter snowshoe hare habitat* no additional habitat may be *regenerated* by vegetation management projects[36].
<u>Standard VEG S2</u> Timber management[47] projects[36] shall not change more than 15 percent of the lynx habitat on NFS lands in an LAU to an unsuitable condition in a ten-year period.	*This number is not included in Alt C. This item is included as part of Guideline VEG G6.*	*None*	None	<u>Standard VEG S2</u> *Standard VEG S2 applies to all timber management[47] projects[36] that regenerate[38] forests, except for fuel treatment projects[36] within the wildland urban interface (WUI) [50] as defined by HFRA[17], subject to the following limitation: Fuel treatment projects[36]*

Table 2-1 Alternatives

Table 2-1 Alternatives

Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
				within the WUI[50] that do not meet Standards VEG S1, VEG S2, VEG S5, and VEG S6 may occur on no more than 6 percent (cumulatively) of lynx habitat on each administrative unit (a unit is a National Forest). For fuel treatment projects[36] within the WUI[50] see guideline VEG G10. *Timber management[47] projects[36] shall not regenerate more than 15 percent of lynx habitat on NFS lands within an LAU in a ten-year period.*
<u>Standard VEG S3</u> Maintain[26] at least ten percent of the lynx habitat in an LAU as denning habitat[6] in patches generally larger than five acres. Where less than ten percent denning habitat is present in an LAU, defer vegetation management projects[36] in stands that have the highest potential to develop denning habitat.	Same as Alt B	<u>Standard VEG S3</u> Maintain at least ten percent of the lynx habitat in an LAU as denning habitat in patches generally larger than five acres. Where less than ten percent denning habitat is present in an LAU, *either:* *1.* Defer vegetation management projects[36] in stands that have the highest potential to develop denning habitat; *or* 2. *Move towards ten percent denning habitat by leaving enough standing trees and coarse woody debris to be similar to what would be there naturally.*	<u>Standard VEG S3</u> Maintain at least ten percent of the lynx habitat in an LAU as denning habitat in patches generally larger than five acres. Where less than ten percent denning habitat is present in an LAU, either: 1. Defer vegetation management projects[36] in stands that have the highest potential to develop denning habitat; or 2. Move towards ten percent denning habitat by leaving enough standing trees and coarse	*This number is not included in Alt F. This item is included as part of Guideline VEG G11.*

Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
			woody debris to be similar to what would be there naturally. *This standard does not apply to fuel treatment projects*[36] *identified through processes such as that described in* *<u>A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment 10-Year Comprehensive Strategy Implementation Plan</u>.*	
<u>Standard VEG S4</u> After a disturbance kills trees in areas five acres or smaller that could contribute to lynx denning habitat, salvage harvest[42] may occur only in: 1. Developed recreation[9] sites, administrative sites, or authorized special use structures or improvements; or 2. Designated road or trail corridors where public safety or access has been or may be compromised; or 3. LAUs where denning habitat has been mapped and field-validated, provided at least ten percent is retained and well	<u>Standard VEG S4</u> After a disturbance kills trees in areas five acres or smaller that could contribute to lynx denning habitat, salvage harvest may occur only in: 1. Developed recreation sites, administrative sites, or authorized special use structures or improvements; or 2. Designated road or trail corridors where public safety or access has been or may be compromised; or 3. LAUs where denning habitat has been mapped and field-validated, provided at least ten percent is retained and well distributed; or 4. *Within 200 feet of dwellings or*	*This number is not included in Alt D. This item is included as part of Guideline VEG G7.*	*This number is not included in Alt E. This item is included as part of Guideline VEG G7.*	*This number is not included in Alt F. This item is included as part of Guideline VEG G11.*

Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
distributed.	*outbuildings.*			
<u>Standard VEG S5</u> Precommercial thinning[35] projects[36] that reduce winter snowshoe hare habitat[51] during the stand initiation structural stage[45] may occur only: 1. Within 200 feet of administrative sites, dwellings or outbuildings. NOTE: Some thinning projects[36], such as white pine pruning or Christmas tree harvest, may occur if winter snowshoe hare habitat is not reduced.	<u>Standard VEG S5</u> *Vegetation management* projects[36] that reduce winter snowshoe hare habitat during the stand initiation structural stage may occur only: 1. Within 200 feet of administrative sites, dwellings or outbuildings; or 2. *For research studies[39] or genetic tree tests evaluating genetically improved reforestation stock.* NOTE: Some vegetation management projects[36], such as white pine pruning or Christmas tree harvest, may occur if winter snowshoe hare habitat is not reduced.	<u>Standard VEG S5</u> Vegetation management projects[36] that reduce winter snowshoe hare habitat during the stand initiation structural stage may occur only: 1. Within 200 feet of administrative sites, dwellings or outbuildings; or 2. For research studies or genetic tree tests evaluating genetically improved reforestation stock; or 3. *For daylight thinning[5] of planted rust-resistant white pine where 80 % of the winter snowshoe hare habitat is retained; or* 4. *To restore[40] whitebark pine; or* 5. *For daylight thinning to release larch or ponderosa pine where 80 % of the winter snowshoe hare habitat is retained; or* 6. *To develop future old growth[32] characteristics in lodgepole; or* 7. *When a broad scale assessment[2] determines that the amount winter snowshoe hare habitat in the stand initiation stage exceeds what would be expected under the normal range of historic conditions; or* 8. *For conifer removal in aspen or daylight thinning around*	<u>Standard VEG S5</u> Precommercial thinning[35] projects[36] that reduce winter snowshoe hare habitat during the stand initiation structural stage may occur only: 1. Within 200 feet of administrative sites, dwellings or outbuildings; or 2. For research studies or genetic tree tests evaluating genetically improved reforestation stock; or 3. *For fuel treatment projects[36] identified through processes such as that described in <u>A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment 10-Year Comprehensive Strategy Implementation Plan</u>.*	<u>Standard VEG S5</u> *Standard VEG S5 applies to all precommercial thinning[35] projects[36], except for fuel treatment projects[36] that use precommercial thinning as a tool within the wildland urban interface (WUI)[50] as defined by HFRA[17], subject to the following limitation: Fuel treatment projects[36] within the WUI[50] that do not meet Standards VEG S1, VEG S2, VEG S5, and VEG S6 may occur on no more than 6 percent (cumulatively) of lynx habitat on each administrative unit (a unit is a National Forest). For fuel treatment projects[36] within the WUI[50] see guideline VEG G10.* Precommercial thinning projects[36] that reduce snowshoe hare habitat, *may occur from the stand initiation structural stage[45] until the stands no longer provide winter snowshoe hare habitat* only: 1. Within 200 feet of administrative sites, dwellings, or outbuildings; or 2. For research studies or

Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
		individual aspen trees. NOTE: Appendix G includes examples of 3, 5, 6 and 7.		genetic tree tests evaluating genetically improved reforestation stock; or 3. *Based on new information that is peer reviewed and accepted by the regional level of the Forest Service, and state level of FWS, where a written determination states:* a. *that a project[36] is not likely to adversely affect lynx; or* b. *that a project[36] is likely to have short term adverse effects on lynx or its habitat, but would result in long-term benefits to lynx and its habitat.* 4. *For conifer removal in aspen, or daylight thinning[5] around individual aspen trees, where aspen is in decline; or* 5. *For daylight thinning of planted rust-resistant white pine where 80% of the winter snowshoe hare habitat[51] is retained; or* 6. *To restore whitebark pine.*

Table 2-1 Alternatives

Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Standard VEG S6 Precommercial thinning projects[36] that reduce winter snowshoe hare habitat during the understory-reinitiation[48] or old-multistory structural stages[31] may occur only: 1. Within 200 feet of administrative sites, dwellings or outbuildings.	Standard VEG S6 *Vegetation management[49] projects[36]* that reduce winter snowshoe hare habitat during the understory-reinitiation or old-multistory structural stages may occur only: 1. Within 200 feet of administrative sites, dwellings or outbuildings; or 2. For research studies[39].	Standard VEG S6 Vegetation management projects[36] that reduce winter snowshoe hare habitat during the understory-reinitiation or old-multistory structural stages may occur only: 1. Within 200 feet of administrative sites, dwellings or outbuildings; or 2. For research studies; or 3. *To maintain planted rust-resistant white pine where 80 % of the winter snowshoe hare habitat is retained; or* 4. *To restore whitebark pine; or* 5. *To release larch or ponderosa pine where 80 % of the winter snowshoe hare habitat is retained; or* 6. *To develop future old growth characteristics in lodgepole; or* 7. *When a broad scale assessment[2] determines that the amount of winter snowshoe hare habitat in multistory structural stages exceeds what would be expected under the normal range of historic conditions.* 8. *When improving or maintaining winter snowshoe hare habitat in the long term.* NOTE: Appendix G includes examples of 3, 5 and 6.	*This number is not included in Alt E. This item is included as part of Guideline VEG G8.*	Standard VEG S6 *Standard VEG S6 applies to all vegetation management[49] projects[36],except for fuel treatment projects[36] within the wildland urban interface (WUI) [50] as defined by HFRA[17], subject to the following limitation:* *Fuel treatment projects[36] within the WUI[50] that do not meet Standards VEG S1, VEG S2, VEG S5, and VEG S6 may occur on no more than 6 percent (cumulatively) of lynx habitat on each administrative unit (a unit is a National Forest). For fuel treatment projects[36] within the WUI[50] see guideline VEG G10.* *Vegetation management projects[36] that reduce snowshoe hare habitat in multi-story mature or late successional forests[29] may occur only:* *1. Within 200 feet of administrative sites, dwellings, outbuildings, recreation sites, and special use permit improvements, including infrastructure within permitted ski area boundaries; or*

Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
				2. *For research studies or genetic tree tests evaluating genetically improved reforestation stock; or* 3. *For incidental removal during salvage harvest*[42] *(e.g. removal due to location of skid trails).* *(NOTE: Timber harvest is allowed in areas that have potential to improve winter snowshoe hare habitat but presently have poorly developed understories that lack dense horizontal cover [e.g. uneven age management systems could be used to create openings where there is little understory so that new forage can grow]).*
Guideline[15] VEG G1 Vegetation management[49] projects[36] should be planned to recruit a high density of conifers, hardwoods and shrubs where such habitat is scarce or not available. Winter snowshoe hare habitat [51] should be near denning habitat[6]. Vegetation management projects[36] should be planned to extend the production of winter snowshoe hare habitat	Guideline VEG G1 Vegetation management[49] projects[36] should be planned to recruit a high density of conifers, hardwoods and shrubs where such habitat is scarce or not available. *Priority should be given to stem-exclusion, closed-canopy structural stage*[46]. Winter snowshoe hare habitat should be near denning habitat. Vegetation management projects[36] should be planned to extend the production of winter snowshoe hare habitat when forage quality and	Same as Alt C	Same as Alt C	Guideline VEG G1 Vegetation management[49] projects[36] should be planned to recruit a high density of conifers, hardwoods, and shrubs where such habitat is scarce or not available. Priority *for treatment* should be given to stem-exclusion, closed-canopy structural stage[46] *stands to enhance habitat conditions for lynx or their prey (e.g. mesic, monotypic lodgepole stands).* Winter snowshoe hare

Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
when forage quality and quantity is declining.	quantity is declining.			habitat[51] should be near denning habitat[6].
Guideline VEG G2 Where more denning habitat is desired, leave standing trees and coarse woody debris in amounts similar to what would be there naturally. Denning habitat should be near winter snowshoe hare habitat.	Same as Alt B	*This number is not included in Alt D. This item is included as part of Standard VEG S3.*	*This number is not included in Alt E. This item is included as part of Standard VEG S3.*	Guideline VEG G2 *This number is not included in Alt F. This item is included as part of Guideline VEG G11.*
Guideline VEG G3 Vegetation management projects[36] designed to retain or restore[40] denning habitat should be located where there is a low probability of stand-replacing fire.	Same as Alt B	Same as Alt B	Same as Alt B	Guideline VEG G3 *This number is not included in Alt F. This item is included as part of Guideline VEG G11.*
Guideline VEG G4 Fire use[11] activities should not create permanent travel routes that facilitate snow compaction. Constructing permanent firebreaks on ridges or saddles should be avoided.	Same as Alt B	Same as Alt B	Same as Alt B	Guideline VEG G4 *Prescribed fire*[34] activities should not create permanent travel routes that facilitate snow compaction. Constructing permanent firebreaks on ridges or saddles should be avoided.
Guideline VEG G5 Habitat for alternate prey species, primarily red squirrel[36], should be provided in each LAU.	Same as Alt B	Same as Alt B	Same as Alt B	Same as Alt B

Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
This number is not included in Alt B. This item is included as Standard VEG S2.	Guideline VEG G6 *Timber management[47] projects[36] should not change more than 15 percent of the lynx habitat in an LAU into an unsuitable condition during a ten-year period.*	*This number is not included in Alt D.*	*This number is not included in Alt E.*	*This number is not included in Alt F. This item is included as Standard VEG S2.*
This number is not included in Alt B. This item is included as Standard VEG S4.	*This number is not included in Alt C. This item is included as Standard VEG S4.*	Guideline VEG G7 *After a disturbance that kills trees in areas five acres or smaller which could contribute to lynx denning habitat, salvage harvest[42] should not occur unless at least ten percent denning habitat in an LAU is retained and well distributed.*	Same as Alt D.	*This number is not included in Alt F. This item is included as part of Guideline VEG G11.*
This number is not included in Alt B. This item is included as Standard VEG S6.	*This number is not included in Alt C. This item is included as Standard VEG S6.*	*This number is not included in Alt D. This item is included as Standard VEG S6.*	Guideline VEG G8 *Vegetation management[49] projects[36] should provide habitat conditions through time that maintain[26] winter snowshoe hare habitat[51] during the understory reinitiation[48] or old-multistory structural stages. Vegetation management projects[36] should be used to improve lynx habitat where dense understories are lacking.*	*This number is not included in Alt F. This item is included as Standard VEG S6.*
This number is not included in Alt B.	*This number is not included in Alt C.*	*This number is not included in Alt D.*	*This number is not included in Alt E.*	Guideline VEG G10 *Fuel treatment projects[36] within the WUI[50] as defined by HFRA[17] should be designed considering Standards VEG S1, S2, S5, and S6 to promote lynx conservation.*

Table 2-1 Alternatives

Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
This number is not included in Alt B.	*This number is not included in Alt C.*	*This number is not included in Alt D.*	*This number is not included in Alt E.*	*Guideline VEG G11* *Denning habitat[6] should be distributed in each LAU in the form of pockets of large amounts of large woody debris, either down logs or root wads, or large piles of small wind thrown trees ("jack-strawed" piles). If denning habitat appears to be lacking in the LAU, then projects[36] should be designed to retain some coarse woody debris[4], piles, or residual trees to provide denning habitat[6] in the future.*
LIVESTOCK MANAGEMENT (GRAZ): *The following objectives, standards, and guidelines apply to grazing projects in lynx habitat in lynx analysis units (LAUs). They do not apply to linkage areas.*				
Objective[30] GRAZ O1 Manage livestock grazing to be compatible with improving or maintaining[26] lynx habitat[23].	Same as Alt B	Same as Alt B	Same as Alt B	Same as Alt B
Standard[44] GRAZ S1 In fire- and harvest-created openings, manage livestock grazing to make sure impacts do not prevent shrubs and trees from regenerating.	Same as Alt B	Same as Alt B	*This number is not included in Alt E. This item is included as Guideline GRAZ G1.*	*This number is not included in Alt F. This item is included as Guideline GRAZ G1.*
Standard GRAZ S2 In aspen stands, manage livestock grazing to contribute to their long-term health and sustainability.	Same as Alt B	Same as Alt B	*This number is not included in Alt E. This item is included as Guideline GRAZ G2.*	*This number is not included in Alt F. This item is included as Guideline GRAZ G2.*

Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Standard GRAZ S3 In riparian areas[41] and willow carrs[3], manage livestock grazing to contribute to maintaining or achieving a preponderance of mid- or late-seral stages[28], similar to conditions that would have occurred under historic disturbance regimes.	Same as Alt B	Same as Alt B	*This number is not included in Alt E. This item is included as Guideline GRAZ G3.*	*This number is not included in Alt F. This item is included as Guideline GRAZ G3.*
Standard GRAZ S4 In shrub-steppe habitats[43], manage livestock grazing in the elevation ranges of forested lynx habitat[23] in LAUs[21], to contribute to maintaining or achieving a preponderance of mid- or late-seral stages, similar to conditions that would have occurred under historic disturbance regimes.	Same as Alt B	Same as Alt B	*This number is not included in Alt E. This item is included as Guideline GRAZ G4.*	*This number is not included in Alt F. This item is included as Guideline GRAZ G4.*
This number is not included in Alt B. This item is included as Standard GRAZ S1.	Same as Alt B	Same as Alt B	Guideline[15] GRAZ G1 *In fire- and harvest-created openings, livestock grazing should be managed so impacts do not prevent shrubs and trees from regenerating.*	Same as Alt E
This number is not included in Alt B. This item is included as Standard GRAZ S2.	Same as Alt B	Same as Alt B	Guideline GRAZ G2 *In aspen stands, livestock grazing should be managed to contribute to their long-term health and sustainability.*	Guideline GRAZ G2 *In aspen stands, livestock grazing should be managed to contribute to the long-term health and sustainability of aspen.*

Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
This number is not included in Alt B. This item is included as Standard GRAZ S3.	Same as Alt B	Same as Alt B	Guideline GRAZ G3 *In riparian areas[41] and willow carrs[3], livestock grazing should be managed to contribute to maintaining or achieving a preponderance of mid- or late-seral stages[28], similar to conditions that would have occurred under historic disturbance regimes.*	Same as Alt E
This number is not included in Alt B. This item is included as Standard GRAZ S4.	Same as Alt B	Same as Alt B	Guideline GRAZ G4 *In shrub-steppe habitats[43], livestock grazing should be managed in the elevation ranges of forested lynx habitat in LAUs[21], to contribute to maintaining or achieving a preponderance of mid- or late-seral stages, similar to conditions that would have occurred under historic disturbance regimes.*	Same as Alt E

HUMAN USE PROJECTS (HU): The following objectives, standards, and guidelines apply to *human use projects, such as special uses (other than grazing), recreation management, roads, highways, and mineral and energy development, in lynx habitat in lynx analysis units (LAUs)*, subject to valid existing rights. *They do not apply to vegetation management projects or grazing projects directly. They do not apply to linkage areas.*

Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Objective[30] HU O1 Maintain[26] the lynx's natural competitive advantage over other predators in deep snow, by discouraging the expansion of snow-compacting activities in lynx habitat[23].	Same as Alt B.	Same as Alt B.	Same as Alt B.	Same as Alt B.

Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Objective HU O2 Manage recreational activities to maintain lynx habitat and connectivity[16].	Same as Alt B.	Same as Alt B.	Same as Alt B.	Same as Alt B.
Objective HU O3 Concentrate activities in existing developed areas, rather than developing new areas in lynx habitat.	Same as Alt B.	Same as Alt B.	Same as Alt B.	Same as Alt B.
Objective HU O4 Provide for lynx habitat needs and connectivity when developing new or expanding existing developed recreation[9] sites or ski areas.	Same as Alt B.	Same as Alt B.	Same as Alt B.	Same as Alt B.
Objective HU O5 Manage human activities – such as exploring and developing minerals and oil and gas, placing utility corridors and permitting special uses – to reduce impacts on lynx and lynx habitat.	Same as Alt B.	Same as Alt B.	Same as Alt B.	Objective HU O5 Manage human activities, *such as special uses, mineral and oil and gas exploration and development, and placement of utility transmission corridors*, to reduce impacts on lynx and lynx habitat.
Objective HU O6 Reduce adverse highway[18] effects on lynx by working cooperatively with other agencies to provide for lynx movement and habitat connectivity[16], and to reduce the potential of lynx mortality.	Same as Alt B.	Same as Alt B.	Same as Alt B.	Same as Alt B.

Table 2-1 Alternatives

Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
<u>Standard[44] HU S1</u> Allow no net increase in designated over-the-snow routes[7] or play areas by LAU[21], unless designation serves to consolidate use and improve lynx habitat[23]. This does not apply inside permitted ski area boundaries, to winter logging, to rerouting trails for public safety, to accessing private inholdings or where regulated by HU S3.	<u>Standard HU S1</u> Allow no net increase in designated over-the-snow routes or play areas *outside baseline areas of consistent snow compaction*[1] by LAU *or in a combination of immediately adjacent LAUs*, unless designation serves to consolidate use and improve lynx habitat. This does not apply inside permitted ski area boundaries, to winter logging, to rerouting trails for public safety, to accessing private inholdings or to access regulated by HU S3. *Use the same analysis boundaries for all actions subject to this standard.*	Same as Alt C	*This number is not included in Alt E. This item is included as Guideline HU G11.*	*This number is not included in Alt F. This item is included as Guideline HU G11.*
<u>Standard HU S2</u> When developing or expanding ski areas, locate trails, access roads and lift termini to maintain[26] and provide lynx diurnal security habitat[10] if it's been identified as a need.	*This number is not included in Alt C. This item is included as Guideline HU G10.*	*This number is not included in Alt D. This item is included as Guideline HU G10.*	*This number is not included in Alt E. This item is included as Guideline HU G10.*	*This number is not included in Alt F. This item is included as Guideline HU G10.*
<u>Standard HU S3</u> Winter access for non-recreation special uses and mineral and energy exploration and development, shall be limited to designated routes[8] or designated over-	Same as Alt B	Same as Alt B	*This number is not included in Alt E. This item is included as Guideline HU G12.*	*This number is not included in Alt F. This item is included as Guideline HU G12.*

Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
the-snow routes[7].				
Guideline[15] HU G1 When developing or expanding ski areas, provisions should be made for adequately sized inter-trail islands that include coarse woody debris[4], so winter snowshoe hare habitat[51] is maintained.	Same as Alt B	Same as Alt B	Same as Alt B	Same as Alt B
Guideline HU G2 When developing or expanding ski areas, nocturnal foraging should be provided consistent with the ski area's operational needs, especially where lynx habitat occurs as narrow bands of coniferous forest across mountain slopes.	Same as Alt B	Same as Alt B	Same as Alt B	Guideline HU G2 When developing or expanding ski areas, *lynx* foraging *habitat* should be provided consistent with the ski area's operational needs, especially where lynx habitat occurs as narrow bands of coniferous forest across mountain slopes.
Guideline HU G3 Recreation developments and operations should be planned in ways that both provide for lynx movement and maintain the effectiveness of lynx habitat[23].	Same as Alt B	Same as Alt B	Same as Alt B	Same as Alt B
Guideline HU G4 For mineral and energy development sites and facilities, remote monitoring should be encouraged to reduce snow compaction.	Same as Alt B	Same as Alt B	Same as Alt B	Same as Alt B

Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Guideline HU G5 For mineral and energy development sites and facilities that are closed, a reclamation plan that restores[40] lynx habitat should be developed.	Same as Alt B	Same as Alt B	Same as Alt B	Same as Alt B
Guideline HU G6 Upgrading unpaved roads to maintenance levels[27] 4 and 5 should be avoided in lynx habitat, if the result would be increased traffic speeds and volumes, or a foreseeable contribution to increases in human activity or development.	Guideline HU G6 *Methods to avoid or reduce effects on lynx should be used in lynx habitat[23] when* upgrading unpaved roads to maintenance levels 4 or 5, if the result would be increased traffic speeds and volumes, or a foreseeable contribution to increases in human activity or development.	Same as Alt C	Same as Alt C	Same as Alt C
Guideline HU G7 New permanent roads should not be built on ridge-tops and saddles, or in areas identified as important for lynx habitat connectivity[16]. New permanent roads and trails should be situated away from forested stringers.	Same as Alt B	Same as Alt B	Same as Alt B	Same as Alt B
Guideline HU G8 Cutting brush along low-speed[25], low-traffic-volume roads should be done to the minimum level necessary to provide for public safety.	Same as Alt B	Same as Alt B	Same as Alt B	Same as Alt B

Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Guideline HU G9 On new roads built for projects[36], public motorized use should be restricted. Effective closures should be provided in road designs. When the project[36] is over, these roads should be reclaimed or decommissioned, if not needed for other management objectives.	Same as Alt B	Same as Alt B	Same as Alt B	Same as Alt B
This number is not included in Alt E. This item is included as Standard HU S2.	Guideline HU G10 *When developing or expanding ski areas and trails, access roads and lift termini should be located to maintain and provide lynx diurnal security[10] habitat if it has been identified as a need.*	Same as Alt C	Same as Alt C	Guideline HU G10 *When developing or expanding ski areas and trails, consider locating access roads and lift termini to maintain and provide lynx security[10] habitat if it has been identified as a need.*
This number is not included in Alt B. This item is included as Standard HU S1.	Same as Alt B	Same as Alt B	Guideline HU G11 *Designated over-the-snow routes[7] or play areas should not expand outside baseline areas of consistent snow compaction[1] by LAU or in a combination of immediately adjacent LAUs, unless designation serves to consolidate use and improve lynx habitat.* *This does not apply inside permitted ski area boundaries, to winter logging, to rerouting trails for public safety, to accessing private inholdings or*	Guideline HU G11 *Designated over-the-snow routes, or designated play areas, should not expand outside baseline areas of consistent snow compaction[1], unless designation serves to consolidate use and improve lynx habitat. This may be calculated on an LAU basis, or on a combination of immediately adjacent LAUs.* *This does not apply inside permitted ski area boundaries, to winter logging,*

Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
			where regulated by HU G12. *Use the same analysis boundaries for all actions subject to this guideline.*	*to rerouting trails for public safety, to accessing private inholdings, or to access regulated by Guideline HU G12.* *Use the same analysis boundaries for all actions subject to this guideline.*
This number is not included in Alt B. This item is included as Standard HU S3.	Same as Alt B	Same as Alt B	Guideline HU G12 *Winter access for non-recreation special uses, and mineral and energy exploration and development, should be limited to designated routes[8] or designated over-the-snow routes[7].*	Same as Alt E
LINKAGE AREAS (LINK): The following objective, standards, and guidelines apply to *all projects within linkage areas,* subject to valid existing rights.				
Objective[30] LINK O1 In areas of intermingled land ownership, work with landowners to pursue conservation easements, habitat conservation plans, land exchanges, or other solutions to reduce the potential of adverse impacts on lynx and lynx habitat.	Same as Alt B	Same as Alt B	Same as Alt B	Same as Alt B
Standard[44] LINK S1 When highway[18] or forest highway[12] construction or reconstruction is proposed in linkage areas[22], identify potential highway crossings.	Same	Same	Same	Same

Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Standard LINK S2 Manage livestock grazing in shrub- steppe habitats[43] to contribute to maintaining[26] or achieving a preponderance of mid- or late-seral stages[28], similar to conditions that would have occurred under historic disturbance regimes.	Same as Alt B	Same as Alt B	*This number is not included in Alt E.. This item is included as Guideline LINK G2.*	*This number is not included in Alt E.. This item is included as* Guideline LINK G2.
Guideline[15] LINK G1 NFS lands should be retained in public ownership.	Same as Alt B	Same as Alt B	Same as Alt B	Same as Alt B
This number is not included in Alt B.. This item is included as Standard LINK S2.	Same as Alt B	Same as Alt B	Guideline LINK G2 *Livestock grazing in shrub-steppe habitats[43] should be managed to contribute to maintaining or achieving a preponderance of mid- or late-seral stages[28], similar to conditions that would have occurred under historic disturbance regimes.*	Guideline LINK G2 Same as Alt E
REQUIRED MONITORING				
Map the location and amount of snow-compacting use that coincided with lynx habitat[23] in LAUs[21] during the 1998-2000 seasons for designated over-the-snow[7] and groomed routes and areas, and areas of	Same as Alt B	Same as Alt B	Same as Alt B	*Map the location and intensity of snow compacting activities, and designated and groomed routes that occurred inside LAUs during the period of 1998 to 2000. The mapping is to be completed within one year of this decision, and changes in*

Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
consistent snow compaction[1]. Such activities include snowmobiling, snowshoeing, cross-country skiing, dog sledding, etc.				*activities and routes are to be monitored every five year after the decision.*
None	None	*Annually monitor the acres of vegetation management[49] projects[36] that occurred in lynx habitat and in winter snowshoe hare habitat[51] during the previous fiscal year.*	Same as Alt D	*Annually report the number of acres where any of the exemptions1 through 6 listed in Standard VEG S5 were applied. Report the type of activity, the number of acres, and the location (by unit and LAU[21]).*
None	None	*Document and evaluate the conditions under which Standard All S2 is applied.*	Same as Alt D	None
None	None	None	None	*Report the acres of fuel treatment[13] in lynx habitat within the wildland urban interface[50], as defined by HFRA[17] when the project[36] decision is approved. Report whether or not the fuel treatment met the vegetation standards. If standard(s) are not met, report which standard(s) are not met, why they were not met, and how many acres were affected.*

Glossary

[1] *Areas of consistent snow compaction* – An area of consistent snow compaction is an area of land or water that during winter is generally covered with snow and gets enough human use that individual tracks are indistinguishable. In such places, compacted snow is evident most of the time, except immediately after (within 48 hours) snowfall. These can be areas or linear routes, and are generally found in or near snowmobile or cross-country ski routes, in adjacent openings, parks and meadows, near ski huts or plowed roads, or in winter parking areas. Areas of consistent snow compaction will be determined based on the acreage or miles used during the period 1998 to 2000.

[2] *Broad scale assessment* – A broad scale assessment is a synthesis of current scientific knowledge, including a description of uncertainties and assumptions, to provide an understanding of past and present conditions and future trends, and a characterization of the ecological, social, and economic components of an area. (LCAS)

[3] *Carr* – Deciduous woodland or shrub land occurring on permanently wet, organic soil. (LCAS)

[4] *Course woody debris* – Any piece(s) of dead woody material, e.g., dead boles, limbs, and large root masses on the ground or in streams. (LCAS)

[5] *Daylight thinning* – Daylight thinning is a form of precommercial thinning that removes the trees and brush inside a given radius around a tree.

[6] *Denning habitat (lynx)* – Denning habitat is the environment lynx use when giving birth and rearing kittens until they are mobile. The most common component is large amounts of coarse woody debris to provide escape and thermal cover for kittens. Denning habitat must be within daily travel distance of winter snowshoe hare habitat – the typical maximum daily distance for females is about three to six miles. Denning habitat includes mature and old growth forests with plenty of coarse woody debris. It can also include young regenerating forests with piles of coarse woody debris, or areas where down trees are jack-strawed.

[7] *Designated over-the-snow routes* – Designated over-the-snow routes are routes managed under permit or agreement or by the agency, where use is encouraged, either by on-the-ground marking or by publication in brochures, recreation opportunity guides or maps (other than travel maps), or in electronic media produced or approved by the agency. The routes identified in outfitter and guide permits are designated by definition; groomed routes also are designated by definition. The determination of baseline snow compaction will be based on the miles of designated over-the-snow routes authorized, promoted or encouraged during the period 1998 to 2000.

[8] *Designated route* – A designated route is a road or trail that has been identified as open for specified travel use.

[9] *Developed recreation* – Developed recreation requires facilities that result in concentrated use. For example, skiing requires lifts, parking lots, buildings and roads; campgrounds require roads, picnic tables, and toilet facilities.

[10] *Security habitat (lynx)* – Security habitat amounts to places in lynx habitat that provide secure winter bedding sites for lynx in highly disturbed landscapes like ski areas. Security habitat gives lynx the ability to retreat from human disturbance. Forest structures that make human access difficult generally discourage human activity in security habitats. Security habitats are most effective if big enough to provide visual and acoustic insulation and to let lynx easily move away from any intrusion. They must be close to winter snowshoe hare habitat. (modified from LCAS)

[11] *Fire use* – Fire use is the combination of wildland fire use and using prescribed fire to meet resource objectives. (NIFC) Wildland fire use is the management of naturally ignited wildland fires to accomplish resource management objectives in areas that have a fire management plan. The use of the term wildland fire use replaces the term prescribed natural fire. (Wildland and Prescribed Fire Management Policy, August 1998)

[12] *Forest highway* – A forest highway is a forest road under the jurisdiction of, and maintained by, a public authority and open to public travel (USC: Title 23, Section 101(a)), designated by an agreement with the FS, state transportation agency, and Federal Highway Administration.

[13] *Fuel treatment* – A fuel treatment is a type of vegetation management action that reduces the threat of ignition, fire intensity, or rate of spread, or is used to restore fire-adapted ecosystems.

[14] *Goal* – A goal is a broad description of what an agency is trying to achieve, found in a land management plan. (LCAS)

[15] *Guideline* – A guideline is a particular management action that should be used to meet an objective found in a land management plan. The rationale for deviations may be documented, but amending the plan is not required. (LCAS modified)

[16] *Habitat connectivity (lynx)* – Habitat connectivity consists of an adequate amount of vegetation cover arranged in a way that allows lynx to move around. Narrow forested mountain ridges or shrub-steppe plateaus may serve as a link between more extensive areas of lynx habitat; wooded riparian areas may provide travel cover across open valley floors. (LCAS)

[17] *HFRA (Healthy Forests Restoration Act)* - Public Law 108-148, passed in December 2003. The HFRA provides statutory processes for hazardous fuel reduction projects on certain types of at-risk NFS and Bureau of Land Management lands. It also provides other authorities and direction to help reduce hazardous fuel and restore healthy forest and rangeland conditions on lands of all ownerships. (Modified from Forest Service HFRA web site.)

[18] *Highway* – The word highway includes all roads that are part of the National Highway System. (23 CFR 470.107(b))

[19] *Horizontal cover* – Horizontal cover is the visual obscurity or cover provided by habitat structures that extend to the ground or snow surface primarily provided by tree stems and tree boughs, but also includes herbaceous vegetation, snow, and landscape topography.

[20] *Isolated mountain range* – Isolated mountain ranges are small mountains cut off from other mountains and surrounded by flatlands. On the east side of the Rockies, they are used for analysis instead of sub-basins. Examples are the Little Belts in Montana and the Bighorns in Wyoming.

[21] *LAU (Lynx Analysis Unit)* – An LAU is an area of at least the size used by an individual female lynx, from about 25 to 50 square miles (LCAS). An LAU is a unit for which the effects of a project would be analyzed; its boundaries should remain constant.

[22] *Linkage area* – A linkage area provides connectivity between blocks of lynx habitat. Linkage areas occur both within and between geographic areas, where basins, valleys, or agricultural lands separate blocks of lynx habitat, or where lynx habitat naturally narrows between blocks. (LCAS updated definition approved by the Steering Committee 10/23/01)

[23] *Lynx habitat* – Lynx habitat occurs in mesic coniferous forest that experience cold, snowy winters and provide a prey base of snowshoe hare. In the northern Rockies, lynx habitat generally occurs between 3,500 and 8,000 feet of elevation, and primarily consists of lodgepole pine, subalpine fir, and Engelmann spruce. It may consist of cedar-hemlock in extreme northern Idaho, northeastern Washington and northwestern Montana, or of Douglas-fir on moist sites at higher elevations in central Idaho. It may also consist of cool, moist Douglas-fir, grand fir, western larch and aspen when interspersed in subalpine forests. Dry forests do not provide lynx habitat. (LCAS)

[24] *Lynx habitat in an unsuitable condition* –Lynx habitat in an unsuitable condition consists of lynx habitat in the stand initiation structural stage where the trees are generally less than ten to 30 years old and have not grown tall enough to protrude above the snow during winter. Stand replacing fire or certain vegetation management projects can create unsuitable conditions. Vegetation management projects that can result in unsuitable habitat include clearcuts and seed tree harvest, and sometimes shelterwood cuts and commercial thinning depending on the resulting stand composition and structure. (LCAS)

[25] *Low-speed, low-traffic-volume road* – Low speed is less than 20 miles per hour; low volume is a seasonal average daily traffic load of less than 100 vehicles per day.

[26] *Maintain* – In the context of this proposal, maintain means to provide enough lynx habitat to conserve lynx. It does not mean to keep the status quo.

[27] *Maintenance level* – Maintenance levels define the level of service provided by and maintenance required for a road. (FSH 7709.58, Sec 12.3) Maintenance level 4 is assigned to roads that provide a moderate degree of user comfort and convenience at moderate travel speeds. Most level 4 roads are double lane and have an aggregate surface. Some may be single lane; some may be paved or

have dust abated. Maintenance level 5 is assigned to roads that provide a high degree of user comfort and convenience. Normally, level 5 roads are double lane and are paved, but some may be aggregate surfaced with the dust abated.

[28] *Mid-seral or later* – Mid-seral is the successional stage in a plant community that is the midpoint as it moves from bare ground to climax. For riparian areas, it means willows or other shrubs have become established. For shrub-steppe areas, it means shrubs associated with climax are present and increasing in density.

[29] *Multi-story mature or late successional forest* – This stage is similar to the *old multistory structural* stage (see below). However, trees are generally not as old, and decaying trees may be somewhat less abundant.

[30] *Objective* – An objective is a statement in a land management plan describing desired resource conditions and intended to promote achieving programmatic goals. (LCAS)

[31] *Old multistory structural stage* – Many age classes and vegetation layers mark the old forest, multistoried stage. It usually contains large old trees. Decaying fallen trees may be present that leave a discontinuous overstory canopy. On cold or moist sites without frequent fires or other disturbance, multi-layer stands with large trees in the uppermost layer develop. (Oliver and Larson, 1996)

[32] *Old growth* – Old growth forests generally contain trees that are large for their species and the site, and are sometimes decadent with broken tops. Old growth often contains a variety of tree sizes, large snags, and logs, and a developed and often patchy understory.

[33] *Permanent development* – A permanent development is any development that results in a loss of lynx habitat for at least 15 years. Ski trails, parking lots, new permanent roads, structures, campgrounds, and many special use developments would be considered permanent developments.

[34] *Prescribed fire* – A prescribed fire is any fire ignited as a management action to meet specific objectives. A written, approved prescribed fire plan must exist, and NEPA requirements met, before ignition. The term prescribed fire replaces the term management ignited prescribed fire. (NWCG)

[35] *Precommercial thinning* – Precommercial thinning is mechanically removing trees to reduce stocking and concentrate growth on the remaining trees, and not resulting in immediate financial return. (Dictionary of Forestry)

[36] *Project* - All, or any part or number of the various activities analyzed in an Environmental Impact Statement, Environmental Analysis, or Decision Memo. For example, the vegetation management in some units or stands analyzed in an EIS could be for fuel reduction, and therefore those units or stands would fall within the term *fuel treatment project* even if the remainder of the activities in the EIS are being conducted for other purposes, and the remainder of those units or stands have other activities prescribed in them. All units in an analysis do not necessarily need to be for fuel reduction purposes for certain units to be considered a *fuel reduction project*.

[37] *Red squirrel habitat* – Red squirrel habitat consists of coniferous forests of seed and cone-producing age that usually contain snags and downed woody debris, generally associated with mature or older forests.

[38] *Regeneration harvest* – The cutting of trees and creating an entire new age class; an even-age harvest. The major methods are clearcutting, seed tree, shelterwood, and group selective cuts. (Helms, 1998)

[39] *Research* – Research consists of studies conducted to increase scientific knowledge or technology. For the purposes of Standards VEG S5 and VEG S6, research applies to studies financed from the forest research budget (FSM 4040) and administrative studies financed from the NF budget.

[40] *Restore, restoration* – To restore is to return or re-establish ecosystems or habitats to their original structure and species composition. (Dictionary of Forestry)

[41] *Riparian area* – An area with distinctive soil and vegetation between a stream or other body of water and the adjacent upland; includes wetlands and those portions of floodplains and valley bottoms that support riparian vegetation. (LCAS)

[42] *Salvage harvest* – Salvage harvest is a commercial timber sale of dead, damaged, or dying trees. It recovers economic value that would otherwise be lost. Collecting firewood for personal use is not considered salvage harvest.

[43] *Shrub steppe habitat* – Shrub steppe habitat consists of dry sites with shrubs and grasslands intermingled.

[44] *Standard* – A standard is a required action in a land management plan specifying how to achieve an objective or under what circumstances to refrain from taking action. A plan must be amended to deviate from a standard.

[45] *Stand initiation structural stage* – The stand initiation stage generally develops after a stand-replacing disturbance by fire or regeneration timber harvest. A new single-story layer of shrubs, tree seedlings, and saplings establish and develop, reoccupying the site. Trees that need full sun are likely to dominate these even-aged stands. (Oliver and Larson, 1996)

[46] *Stem exclusion structural stage (Closed canopy structural stage)* – In the stem exclusion stage, trees initially grow fast and quickly occupy all of the growing space, creating a closed canopy. Because the trees are tall, little light reaches the forest floor so understory plants (including smaller trees) are shaded and grow more slowly. Species that need full sunlight usually die; shrubs and herbs may become dormant. New trees are precluded by a lack of sunlight or moisture. (Oliver and Larson, 1996)

[47] *Timber management* – Timber management consists of growing, tending, commercially harvesting, and regenerating crops of trees.

[48] *Understory re-initiation structural stage* – In the understory re-initiation stage, a new age class of trees gets established after overstory trees begin to die, are removed, or no longer fully occupy their growing space after tall trees abrade each other in the wind. Understory seedlings then re-grow and the trees begin to stratify into vertical layers. A low to moderately dense uneven-aged overstory develops, with some small shade-tolerant trees in the understory. (Oliver and Larson, 1996)

[49] *Vegetation management* – Vegetation management changes the composition and structure of vegetation to meet specific objectives, using such means as prescribed fire or timber harvest. For the purposes of this proposal, the term does not include removing vegetation for permanent developments like mineral operations, ski runs, roads and the like, and does not apply to fire suppression or to wildland fire use.

[50] *Wildland urban interface (WUI)* - Use the definition of WUI found in the Healthy Forests Restoration Act. The full text can be found at HFRA § 101. Basically, the WUI is the area adjacent to an at-risk community that is identified in the community wildfire protection plan. If there is no community wildfire protection plan in place, the WUI is the area 0.5 mile from the boundary of an at-risk community; or within 1.5 miles of the boundary of an at-risk community if the terrain is steep, or there is a nearby road or ridgetop that could be incorporated into a fuel break, or the land is in condition class 3, or the area contains an emergency exit route needed for safe evacuations. (Condensed from HFRA. For full text see HFRA § 101.)

[51] *Winter snowshoe hare habitat* – Winter snowshoe hare habitat consists of places where young trees or shrubs grow densely – thousands of woody stems per acre – and tall enough to protrude above the snow during winter, so snowshoe hare can browse on the bark and small twigs (LCAS). Winter snowshoe hare habitat develops primarily in the stand initiation, understory reinitiation and old forest multistoried structural stages.

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Management direction considered

This section replaces the section in the DEIS labeled "Management direction considered, but not in detail". This section now describes the following:

- what management direction is needed;
- management direction included in Alternative B;
- what comments were received regarding Alternative B;
- how Alternatives C, D, and E addressed those comments;
- what comments were received on Alternative E in the DEIS, including those from FWS; and
- how those comments were considered in development of the FEIS, Alternative F.

Management direction related to habitat elements

Lynx require certain habitat elements to persist in a given area. Lynx productivity is highly dependent on the quantity and quality of winter snowshoe hare habitat. Lynx use a variety of forest ages and structural stages. They use young regenerating forests and multistoried forests that provide habitat for snowshoe hares. Certain activities, such as timber harvest, can affect the amount and distribution of these habitat elements, which can in turn affect lynx productivity.

Standards and guidelines relating to quantity of winter snowshoe hare habitat

Standards VEG S1 and S2 were developed to address the quantity of winter snowshoe hare habitat by providing a distribution of age classes across an area.

In Alternative B, Standard VEG S1 says if more than 30 percent of the lynx habitat in an LAU is in an *unsuitable condition*, then vegetation management projects cannot make more habitat unsuitable. *Unsuitable lynx habitat* consists of young regenerating forests where the trees and brush are generally less than 10 to 30 years old and have not yet grown tall enough to protrude above the snow in winter. If a broad-scale assessment is completed, the standard can be modified to take local conditions into account.

The standard tries to make sure blocks of quality lynx habitat are maintained in each LAU, to sustain a good distribution of lynx habitat at the scale of a lynx home range.

Unsuitable habitat may grow into foraging condition over time. Providing a distribution of forest ages is important; so large parts of each LAU are always winter snowshoe hare habitat.

Some people said 30 percent was "one-size-fits-all" direction that does not take into account local conditions or natural disturbances. Others said allowing 30

percent unsuitable was no real improvement. People said the proposal should make a decision about whether 30 percent unsuitable (or any amount) was too high for lynx to recover, and whether stricter standards were needed.

The 30 percent criterion of unsuitable habitat is based on a model to maintain lynx habitat over time (Brittel et al. 1989).

Fire is the most common disturbance process in lynx habitat. Generally, large stand-replacing fires burn every 40 to 200 years and smaller low intensity fires burn in the intervals between the stand replacing fires (Fisher and Bradley 1987; Smith and Fisher 1997). Based on this historic fire pattern in the northern Rockies, it is likely wildfires would often create more than 30 percent unsuitable habitat in an LAU.

The ID team considered this comment and determined the 30 percent criterion was appropriate to provide a mosaic of habitat conditions. A higher percentage would not provide the desired mosaic (more habitat could be in young regenerating forests) and a lower percentage is not warranted based on fire disturbance processes in lynx habitat.

Some people said that if management actions were supposed to emulate natural processes, especially with prescribed burns, then some scale larger than one LAU should be used to apply the 30 percent standard. Some people felt that combining the LAUs during analysis would be one way to do this.

In Alternative B standard VEG S1 applies *to each LAU*. Based on comments and analysis of wildfire processes, the application was modified in Alternatives C, D, and E. In Alternatives C and E (DEIS preferred alternative) this standard would apply to *"each LAU or a combination of immediately adjacent LAUs."* In Alternative D the standard would apply to *"each sub-basin or isolated maintain range."*

The FWS commented on the DEIS preferred Alternative E and recommended that VEG S1 be applied to a single LAU. They said application of conservation measures at the LAU scale requires blocks of quality habitat to be maintained within each LAU, maintaining a good distribution of lynx habitat at the scale of a lynx home range, thereby maintaining a good distribution of lynx habitat conditions across the range of lynx. They were concerned that if the standard were applied at a larger scale than an LAU, it could result in large contiguous areas devoid of providing the variety of habitat elements needed by lynx. In addition, they said the broad-scale assessment allowed for in Standard VEG S1 allows for deviation based local analysis.

Alternative F applies the management direction to a single LAU to ensure a variety of successional stages are provided within a home range.

Some people commented that the term "unsuitable habitat" was confusing and was a mis-application of the word. In addition, some people wanted to clarify what type of

vegetation management projects create "unsuitable habitat".

"Unsuitable habitat" refers to those forests in the early stand initiation structural stage which are too short to provide for winter snowshoe hare habitat (the trees have not grown above the snow line). This habitat is created by stand replacing fires or regeneration harvest (clearcut, seed tree, shelterwood). The habitat *may be* suitable for lynx and lynx prey in seasons other than winter if they provide good *horizontal cover.*

Standard VEG S1 in Alternative F was modified to be more explicit, so it now reads: "If more than 30 percent of the lynx habitat in an LAU is currently in a stand initiation structural stage that does not yet provide winter snowshoe hare habitat no additional habitat may be regenerated by vegetation management projects."

A few people felt Standard VEG S1 should ensure an even distribution of lynx habitat, but it does not do so.

It would not be possible to meet a standard for even distribution of lynx habitat elements in every LAU. Lynx habitat is found at mid to upper elevations, and the geology that forms those elevations is not evenly distributed. Lynx habitat is characterized by abundant moisture; this too, is not evenly distributed. In addition, some LAUs include private land, but the management direction would only apply to federal lands. However, the 30 percent takes private land into account if that private land is within an LAU.

Lynx use a variety of forest ages, types, and structural stages. It would be very difficult to produce an even distribution of these habitats in every section on the publicly owned land, much less on the private land. Natural disturbances, such as fire, can change large areas of habitat in a matter of days, frustrating attempts at producing an even distribution. A lynx home range can be from 25 to 50 square miles, or more. With home ranges of that size it is unnecessary to have an even distribution of lynx habitat in every square mile section of ground in order to conserve Canada lynx. For these reasons the ID team did not consider this request in detail.

In addition, lynx can travel long distances easily, so they can find the habitat components they seek over a large landscape.

In Alternative B, Standard VEG S2 says timber management projects shall not change more than 15 percent of lynx habitat in an LAU to an unsuitable condition in a 10-year period.

Some people said Standard VEG S2 should not single out a specific management practice, when other practices and wildland fires can have the same result. Others questioned whether or not this was a relevant sideboard since very few LAUs exceed this standard due to timber harvest.

The ID team explored why this standard singles out timber management projects. The purpose of the standard was to limit

the rate of management induced change in lynx habitat within an LAU to ensure sufficient habitat for lynx through time and reduce the likelihood that LAUs would be rendered incapable of supporting lynx by an action or several actions over a short period of time. Timber harvest (regeneration harvest) and wildfires are the predominate events that create "unsuitable habitat" or young regenerating forests. Prescribed fire, can in some cases, create unsuitable habitat if the fires are stand replacing.

Standard VEG S1 incorporates habitat changes created by all events (wildland fire, prescribed fire and regeneration harvest) that create the stand initiation structural stage. Standard VEG S2 constrains the amount of timber harvest over a 10 year period in order to regulate the amount of management induced change that occurs in a short period of time. Since timber harvest—specifically regeneration harvest—is the primary management activity that results in "unsuitable habitat" (stand initiation structural stage)—it is the activity which is the focus of this standard.

In 2003, the ID team analyzed the effect that timber harvest has historically had on creating "unsuitable habitat" on Forest Service lands in Region 1 (Hillis et al. 2003). The analysis was based on the amount of regeneration harvest occurring between 1986 and 2001, by 4th code hydrologic unit (HUC). The analysis found that only 2.5 percent of the HUCs exceeded the 15 percent criterion due to timber harvest on federal lands (13 percent if federal and non-federal lands are considered together). Fire was determined to be the dominate action that created stand initiation structural stages.

In the DEIS, Standard VEG S2 was changed to Guideline VEG G6 in Alternative C, and dropped as a standard or guideline in Alternatives D and E. Management direction was lessened in these alternatives primarily because very few LAUs exceeded the 15 percent criterion (Hillis et al. 2003).

FWS comments on the DEIS say that dropping Standard VEG S2 could allow potentially negative effects to lynx to accumulate. Removal of the standard could result in reducing the amount of lynx habitat over a short period of time. Based on these comments Standard VEG S2 was included in Alternative F. In addition, the standard was modified to clarify that it only applies to timber management practices that regenerate a stand.

In Alternative B Guideline VEG G1 recommends creating forage where it is lacking. The intent is to create forage habitat where it is lacking in a manner that result in dense horizontal cover once the trees grow up.

Some people said more guidance was needed about what stand conditions should be targeted to create forage. Others said we should rely on natural disturbances to provide hare habitat, or that we need to consider connectivity of hare habitat.

Timber harvest can be beneficial, benign, or detrimental depending on the harvest method, the spatial and temporal occurrence on the landscape, and the inherent vegetation potential of the site (Appendix P). An option to have the guideline only apply to natural disturbances was considered but dismissed because the focus of the guideline is the "intent" not the tool. The method to achieve the intent should not be limited, especially since it has been found that timber harvest can be done in a manner that results in good winter snowshoe hare habitat over time.

In Alternatives C, D, and E the guideline adds that "*priority should be given to stem-exclusion, closed-canopy structural stage.*" Alternative F adds that "*priority for treatment should be given to stem-exclusion, closed-canopy structural stage stands to enhance habitat conditions for lynx and their prey (e.g. mesic, monotypic lodgepole stands).*"

Include a standard to limit type conversions

Forest management can result in changing the dominant vegetation from one species to another, called a "type conversion." Silvicultural prescriptions can be designed, for instance, to change the species composition from lodgepole pine to western larch, which would reduce winter snowshoe hare habitat. Some people said a standard should be considered to limit type conversions to tree species that are of less value to lynx.

On page 34 of the 2000 Biological Opinion (USDI FWS 2000a), FWS discusses habitat conversions and identifies the conservation measures in the LCAS that relate to this concern. The action alternatives include measures that promote management toward historic conditions and restrict moving away from them (see Objective VEG O1; Standards GRAZ S3 and S4, and LINK S2; and Guidelines GRAZ G3 and G4, and LINK G2).

The ID team reviewed the measures in the action alternatives and decided another standard that restricts type conversions was not necessary because:

- The alternatives include objectives that describe the desired condition of lynx habitat;
- Vegetative management projects should be designed to meet or move toward meeting the objectives; and
- Such language was not included in the LCAS and no new information has been found to indicate such direction is necessary.

Limit the size of clearcuts and other regeneration harvest units

Some people wanted an alternative to limit the size of clearcuts to 40 acres. They wanted regeneration timber harvest limited to irregularly shaped cutting units no more than 300 feet wide. They wanted a standard that would make sure lynx travel corridors would be wider than 330 feet and that cutting units would be designed to preserve travel corridors, especially along ridges, saddles, and riparian areas.

Standards ALL S1 and VEG S2, and Objectives VEG O1 and VEG O4 indirectly respond to concerns about unit size and travel corridors. Openings created by even-aged harvest are normally 40 acres or less. Creating

larger openings requires 60-day public review and Regional Forester approval, with some exceptions (R1 Supplement Forest Service Handbook 2400-2001-2; R2 Supplement 2400-99-2).

Koehler (1990) speculated that openings created by regeneration harvest, where the distance-to-cover was greater than 325 feet, might restrict lynx movement and use patterns until the forest re-grows. While it is assumed lynx would prefer to travel where there is forested cover, the literature contains many examples of lynx crossing unforested openings (Roe et al. 2000).

Lynx evolved with disturbance. In the northern Rockies, the most common disturbance is fire. The LCAS and Alternative B recognize that fact. Fires come in many sizes. Most are small. Generally, a few, very large fires burn most of the acres. Recent burns provide herbaceous summer foods; older burns provide woody winter browse (Fox 1978).

The LCAS says landscapes with trees of various heights that support dense understory vegetation may be more likely to support high snowshoe hare populations (Poole et al. 1996). Trees in a distribution of ages may provide a greater range of available browse as snow depths vary throughout the winter.

Larger openings can often more closely resemble vegetative patterns similar to natural disturbance events (e.g. fire, windthrow, and insect outbreaks) (Appendix P). A disturbance pattern characterized by a few large blocks may be desirable if large areas of forested habitat are a management goal, or if the predation and competition that occur at the edges between vegetation types is a problem (Ruggiero et al. 2000a, p. 431).

While it is true lynx may not use large openings initially, once they have re-grown and can provide cover, generally after ten to 30 years, such areas may be important to lynx (Appendix P, p. 40092).

The action alternatives already contain direction to consider natural disturbances and maintain habitat connectivity. Based on the management direction in the alternatives, and evaluating the information in the *Ecology and Conservation of Lynx in the United States* (Ruggiero et al. 2000a) and the LCAS, the ID team decided that a standard limiting the size of openings was unlikely to improve lynx conservation.

Standards and guidelines relating to quality of winter snowshoe hare habitat

Snowshoe hares are the primary prey for lynx. Snowshoe hare habitat consists of forests where young trees or shrubs grow densely. During winter, hare forage is limited to twigs and stems that protrude above the snow and the hares can reach. Winter snowshoe hare habitat is a limiting factor for lynx persistence. It can be found in young regenerating forests which are dense; or in multistory forests that have trees whose limbs come down to snow depth and have an abundance of trees in the understory. Two standards were

developed to address management actions: (1) Standard VEG S5 addresses actions occurring in young regenerating forests; and (2) Standard VEG S6 addresses actions occurring in multistory forests.

In Alternative B, Standard VEG S5 does not allow precommercial thinning that reduces winter snowshoe hare habitat in the stand initiation structural stage except for within 200 feet of administrative sites, dwellings or outbuildings.

Some people said this standard should apply to all vegetation management projects, not just precommercial thinning.

Precommercial thinning is the primary activity that occurs in young regenerating forests. On occasion, other activities such as fuel treatments or prescribe burning, could occur. Alternatives C and D were expanded to apply to all vegetation management projects. Alternative E, the DEIS preferred alternative, only applied to precommercial thinning projects.

Only a few comments were received on the DEIS saying the standard should apply to all type of projects. FWS did not comment on the more narrow application of the standard.

Alternative F only applies to precommercial thinning because it is the predominate activity in young regenerating forests and it is has been identified as the risk factor for reducing winter snowshoe hare habitat (LCAS, Ruggiero et al. 2000a, USDA FS and USDI BLM 2000a, USDI FWS 2000a, 2000b, USDI FWS 2003).

As noted earlier in the issues section some people said that precommercial thinning should be allowed to restore tree species in decline or to encourage future large trees.

Alternative D addresses this issue by allowing precommercial thinning of planted western white pine, whitebark pine, aspen, and larch, ponderosa pine and lodgepole pine in certain situations. Alternative E, the DEIS preferred alternative only allowed precommercial thinning adjacent to structures, for research or genetic tests, or for fuel treatment projects identified in a collaborative manner.

Several comments on the DEIS said that the allowances for precommercial thinning in Alternative D should be incorporated into the final alternative. Several comments said that some allowance for adaptive management should be incorporated and that thinning should be allowed where it could be done to promote or prolong winter snowshoe hare habitat.

FWS said that thinning adjacent to administrative sites, dwellings, or outbuildings and for research and genetic tests would have little effect on lynx or their habitat. In addition, they said the following thinning activities would have cumulatively little effect upon lynx habitat and, in some cases, advance natural ecological conditions. These include: (1) daylight thinning of planted rust-resistant white pine where 80 percent of winter snowshoe hare habitat is maintained; (2) thinning within whitebark pine stands; (3) white

pine pruning and (4) thinning for Christmas trees.

The ID team evaluated the comments and incorporated the following elements into Alternative F.

- Since Standard VEG S5 is concerned with reduction of winter snowshoe hare habitat, white pine pruning and thinning for Christmas trees can occur if winter snowshoe hare habitat is not reduced. Generally these activities are done on an individual tree basis and do not change the characteristics of the habitat.
- Precommercial thinning can be done adjacent to administrative sites, dwellings, or outbuildings and for research and genetic tests since these would have benign effects on lynx.
- Precommercial thinning can be done for planted rust-resistant white pine, whitebark pine, and aspen. Thinning to enhance whitebark pine and aspen would benefit other wildlife species and effects only limited acres in lynx habitat. Daylight thinning of white pine may reduce some habitat effectiveness, but since this tree species has declined 95 percent across its range, the ID team determined it was important to allow a limited amount of thinning to retain the species on the landscape.

The ID team considered allowing precommercial thinning in vast areas of young regenerating forests where precommercial thinning could be done to prolong winter snowshoe hare habitat. The team also considered precommercial thinning in young regenerating forests composed primarily of western larch with more than 10,000 trees per acre – where larch would be removed to favor other species that provide better winter snowshoe hare habitat. In both these situations the general belief is that these activities may be beneficial to lynx in the long term, but information is not available at this time to support that hypothesis. So, the standard was modified to provide an avenue to consider new information that may in the future prove or disprove these hypotheses. The criterion provide in Alternative F states:

Based on new information that is peer reviewed and accepted by the regional level of the Forest Service and the state level of FWS, where a written determination states:

a. that a project is not likely to adversely affect lynx; or
b. that a project is likely to have short term adverse effects on lynx or its habitat, but would result in long-term benefits to lynx and its habitat.

In addition, under Alternative F Standard VEG S5 would not apply to fuel treatment projects that use precommercial thinning as a tool within the WUI (see discussion regarding fuel treatments in the next section).

In Alternative B, Standard VEG S6 does not allow precommercial thinning that reduces winter snowshoe hare habitat in multistory forests except for within 200

feet of administrative sites, dwellings or outbuildings.

As noted in Issue #3 some people said the management direction should preclude all activities that reduce winter snowshoe hare habitat in multistory forest.

Alternatives C, D, and F would apply the management direction to all vegetation management activities in multistory forests that provide winter snowshoe hare habitat. Each alternative has different allowances for vegetation management. Alternative E, the DEIS preferred alternative changed the management direction from a standard to Guideline VEG G8. The intent of the guideline was to direct vegetation projects to provide winter snowshoe hare habitat through time.

Multistory forest structures can develop from natural processes, such as insects and diseases and fire, or management actions like timber harvest that create small openings where trees and shrubs can grow.

Comments on the DEIS suggested that management direction for multistory forests should be in the form of a standard. FWS suggested the agencies review the latest information or research on lynx use of forests in multistoried structural stages prior to developing a final preferred alternative.

The ID team reviewed the latest research and discussed lynx use in multistory forests with lynx researchers, the Lynx Biology Team, and FWS. Based on the review and discussions, the ID team retained Standard VEG S6 in Alternative F, which limits vegetation management activities that reduce winter snowshoe hare habitat in multistory forests. Minor reductions in winter snowshoe hare habitat were allowed for activities within 200 feet of structures, research or genetic tests, and for incidental removal during salvage harvest (associated with skid trails) in Alternative F. The standard also says that timber harvest is allowed in areas that have the potential to improve winter snowshoe hare habitat but presently have poorly developed understories. The standard would not apply to fuel treatments within the WUI (see discussion regarding fuel treatments in the next section).

Denning habitat

Woody debris – piles of wind-thrown trees, root wads, or large down trees – provides lynx denning sites. Large woody debris gives kittens an escape route from predators, as well as cover from the elements. During the first few months of life, when kittens are left alone while the mother hunts, denning habitat must be available throughout the home range (Bailey 1974). It is necessary for lynx survival. The proposed action included two standards and two guidelines which provided management direction for denning habitat.

In Alternative B Standard VEG S3 defers vegetation management projects in places with the potential to develop into denning habitat if an LAU contains less than ten percent denning habitat. ***Standard VEG S4*** limits salvage harvest

in some situations. ***Guideline VEG G2*** says when more denning habitat is desired to leave standing trees and coarse woody debris. ***Guideline VEG G3*** says to locate denning habitat where there is a low probability of stand-replacing fire.

Development of alternatives for the DEIS

Some people said that den sites can be found in old regenerating forests and the agency should be allowed the flexibility to create denning habitat in regeneration units, especially since denning habitat should be located in or adjacent to forage. In Maine 17 den sites were located in a variety of stand types, including 10-20 year old clearcuts adjacent to residual stands (Appendix P).

After reviewing the literature, the ID team determined it was reasonable to have an alternative that allows for flexibility to mitigate or create denning habitat, especially when there is less than 10 percent denning habitat. Alternatives D and E modify Standard VEG S3 to say where there is less than 10 percent denning habitat either: 1) defer management, or 2) move towards 10 percent by leaving standing dead trees or piles of coarse woody debris. This combined the guidance in Alternative B, Guideline VEG G2 with the Standard VEG S3.

Some people said salvage harvest should not be singled out because it is not the only management action that removes denning habitat. Standard VEG S4 limits salvage harvest after a disturbance kills trees in areas five acres or smaller – if there is less than 10 percent denning habitat.

The ID team evaluated whether other management actions, such as prescribed burning, chipping, piling and burning, etc. should be precluded. Salvage harvest is the primary management action that removes denning habitat because it removes dead and down timber; therefore the team determined that other actions did not need to be constrained. However, the team determined that Standard VEG S4 should be a guideline in Alternatives D and E. The guideline says that when there is less than 10 percent denning habitat, then units should consider retaining small areas of dead trees. As noted in Alternatives D and E, Standard VEG S3, units can mitigate when there is less than 10 percent denning habitat. It is possible to create denning habitat or retain pockets, but units should be allowed to evaluate denning needs on a site specific basis.

The intent of Alternatives D and E, is where denning habitat is lacking, units should recognize it, retain large and small patches and/or mitigate, especially if it denning habitat can be created in or near new forage areas. In most areas denning habitat is likely not limiting because it is found in such a variety of stand conditions and ages.

Considerations for alternatives in the FEIS

Some people said there was no basis for retaining ten percent denning habitat – they wanted the standard dropped altogether.

Others wanted more denning habitat required.

Some people asked for an alternative to prohibit harvest in old growth or mature timber to protect denning habitat. Some people said that all old growth should be protected by management direction because some administrative units do not meet old growth standards.

Some people said allowing salvage logging in disturbed areas smaller than five acres lacked a scientific basis and that all salvage harvest should be deferred.

Most comments on the DEIS said that management direction for denning habitat should be in the form of standards and salvage logging should be prohibited.

FWS supported Standard VEG S3, including conditions 1 and 2 in Alternative E, and was concerned about changing Standard VEG S4 into Guideline VEG G7. FWS recommended development of a standard that: 1) maintains ten percent denning habitat within an individual LAU; 2) is randomly/evenly distributed across the LAU; and 3) ensures recruitment of future denning habitat.

Based on these comments, the ID team reconsidered the management direction for denning habitat. The team held discussions with the researchers, lynx biology team and FWS to further explore denning habitat - where it is found, how to measure it, and how to ensure plans provide the appropriate level of management direction.

<u>Where denning habitat is found:</u> Since 1989 researchers have discovered that lynx denning habitat is found in a variety of structural stages from young regenerating forests to old forests. The integral component of lynx den sites appears to be the amount of downed, woody debris, not the age of the forest stand (Mowat, et al. 2000). Research by Squires (pers. com. Oct. 30, 2006) has found that of 40 den sites in northwest Montana most were located under large logs but "jack-strawed" small diameter wind thrown trees, root wads, slash piles and rock piles were also used. These structural components of lynx den sites can often be found in managed (logged) and unmanaged (e.g. insect damaged, wind-throw) stands.

<u>How to measure denning habitat:</u> Retaining ten percent denning habitat is based on maintaining lynx habitat over time (Brittel et al. 1989). Brittel recommended a balance of conditions – 30 percent forage, 30 percent unsuitable that would grow into forage, 30 percent travel, and ten percent denning.

The ID team evaluated how to measure 10 percent denning based on where the habitat can be found. The team evaluated using mature and over-mature forests as a first approximation of denning habitat. Generally mature and over-mature forests contain a component of dead and down trees which lynx use. If these two components were used then all units would show much more than ten percent denning habitat as all forests have at least twenty percent of their forest in mature stand structures. In addition, these stand structures do not

account for all the stand conditions where denning habitat can be found because denning habitat can be found in young forests with slash piles, lodgepole forests with insect and disease outbreaks, areas recently burned in wildfires, as well as variety of other forest conditions. Based on these discussions, the ID team, with agreement from FWS, determined that using stand structures as a proxy would show an overabundance of denning habitat; therefore the requirement to retain ten percent was found not to be a useful measure.

How to provide for denning habitat:

The ID team considered restricting harvest in mature forests and old growth. The important component for all lynx den sites appears to be the amount of down woody debris present, not the age of the forest (Mowat et al. 2000, Appendix P). Old growth and mature forests can provide denning habitat, but based on review of research a variety of forest structures also provide denning habitat. The ID team considered prohibiting timber harvest in old growth but dismissed this from detailed consideration because denning habitat is found in a variety of forest structures.

The ID team considered restricting salvage harvest. Standard VEG S4 in Alternatives B and C limits salvage harvest after a disturbance kills trees in areas five acres or smaller - if there is less than 10 percent denning habitat. The standard was changed to a guideline in Alternatives D and F. The guideline says that when there is less than 10 percent denning habitat, then units should consider retaining small areas of dead trees.

Salvage harvest can remove denning habitat. However, den sites can be found in areas with large logs, "jack-strawed" small diameter wind thrown trees, root wads, slash piles, and rock piles. These need not be extensive – they are small areas that provide hiding cover for lynx.

The team reevaluated whether or not denning habitat is a limiting factor for lynx. Based on discussions with research, the team reaffirmed that denning habitat is found in a variety of forest conditions and these habitat elements are generally found across broad landscape, and lynx denning sites are not believed to be a limiting factor (J. Squires, pers. com. Oct. 30, 2006). In addition, management actions can create denning habitat by strategically leaving piles of woody debris, or leaving residual trees where denning habitat is lacking.

Therefore the ID team determined that restricting salvage harvest was not necessary, but that projects should consider the abundance and distribution of denning habitat in their project design.

The ID team considered management direction in the form of standards vs. guidelines. The ID team determined management direction for denning habitat should be incorporated into one set of management direction. Incorporating all the direction into one standard or guideline reduces the

potential for conflicts between directions, focusing on the important components of denning habitat.

The ID team determined a guideline would be best suited for this management direction because denning habitat can be found in a variety of forest structures and is not a limiting factor for lynx. The management direction would provide design features for projects. Therefore the ID team developed Guideline VEG G11 in Alternative F. The guidance is to: 1) have denning habitat distributed across an LAU (in the form of pockets of large woody debris, either down logs or root wads, or large piles of jack-strawed trees); and 2) if denning habitat is lacking, projects should be designed to retain coarse woody debris – by leaving piles or retaining residual trees that can become denning habitat later.

Fuel treatments

Most lynx habitat consists of high-elevation spruce/fir and lodgepole pine forests, but some lynx habitat may be found in mixed conifer forests. Generally, forests in lynx habitat are close to historic conditions, meaning the long fire return interval has not been affected by more recent fire suppression as is the case in dryer forests with short fire return intervals. However, some stand conditions are conducive to extreme fire behavior because of insect and disease mortality or the amount of tree limbs that provide ladder fuels. Fuel treatments designed to reduce ladder fuels or reduce the potential size and severity of wildland fires may be proposed in lynx habitat.

Some people thought the management direction might preclude fuel treatment, especially in the WUI.

In Alternative A, there would be no change in existing plan direction on the treatment of fuels.

Alternative B would allow fuel treatments to go forward if they:

- Meet the 10 percent denning standard (Standard VEG S3 and S4)
- Meet 30 percent unsuitable habitat standard (Standard VEG S1) or 15 percent unsuitable habitat created by timber harvest standard (Standard VEG S2)
- Use methods other than precommercial thinning in winter snowshoe hare habitat (Standards VEG S5 and VEG S6)

Alternatives C and D would not allow any type of fuel reduction project that reduced winter snowshoe hare habitat – except within 200 feet of structures.

Alternative E was designed to address the issue regarding fuel treatments, while contributing to the conservation of lynx. None of the vegetation standards (Standards VEG S1, S3 and S5) would apply to fuel treatments developed in a collaborative manner, as described in the *10-Year Comprehensive Strategy Implementation Plan* (USDA FS 2001b). This exception was used because a multi-party Memorandum of Understanding was signed in 2003 by the FS, BLM, and FWS (USDA FS et al. 2003.

The ID team considered limiting fuel treatments to just the WUI in the design of Alternative E. However, the National Fire Plan and Comprehensive Strategy both identify the potential need to treat fuels outside the WUI, particularly those forests in Condition Classes 2 and 3. Most of the forests in lynx habitat are likely to be in Condition Class 1; however a few may be in Condition Class 2 or 3.

Many comments were received on the DEIS regarding fuel treatments. Some people suggested there be no exemptions for fuel treatments. Several environmental groups suggested that only fuel treatments within 500 yards of human residences and other structures be allowed because these areas are generally not appropriate to restore lynx anyway. Others felt the exemptions should only apply to the WUI and that the agencies should define the WUI. Others liked the exemptions as they were written in Alternative E.

FWS cautioned against exempting a broad range and unknown number of actions from plan direction. They felt, as currently worded in Alternative E, the exemption was sufficiently vague that it did not allow an adequate analysis of potential effects upon lynx or lynx habitat.

FWS suggested Standard VEG S5 be modified to restrict precommercial thinning to within one mile of structures. They did not believe any exemptions were needed for Standards VEG S1 or S2 since so very few LAUs were near the thresholds identified in these standards. They felt very few proposals would be constrained by the standards. They also questioned why Condition Class 1 forests were not specifically excluded from the exemptions. Condition Class 1 forests include areas where fires have burned as often as they did historically; the risk of loosing key ecosystem components is low; and vegetation composition and structure is intact and functioning. The FWS went on to say they recommended that processes, actions, or types that would be exempt be clearly identified.

The ID team and Responsible Officials reviewed and discussed the comments with FWS and decided to modify the fuel treatment exemption for Alternative F. The team and FWS thoroughly discussed the issue of how to allow for fuel treatments to reduce the hazard to communities - while providing for the conservation and recovery of lynx. The following summarizes the outcome of the discussions.

1) Outcome: The vegetation standards would not apply to fuel treatment projects within the WUI.

   Discussion: Under Standards VEG S1 and S2 it is likely very few projects would exceed the 30 percent and 15 percent criteria because many fuel treatment projects are not regeneration harvest. If regeneration harvest is applied it is likely to be done to create a fuel break adjacent to communities or to break up the continuity of fuels. The ID team did not want to limit the ability create fuel breaks where they are needed.

2) Outcome: Treatment in all condition classes would be allowed.

   Discussion: Many forests in lynx habitat are in Condition Class 1, meaning these forests have not missed a fire cycle because fire only occurs every 100 to 200 years. However, some of these Condition Class 1 forests can still be a threat to communities. An example is lodgepole pine forests which are at the age of being susceptible to mountain pine beetle outbreaks. Regenerating lodgepole pine, adjacent to a community, may be needed to reduce the severity and size of a wildland fire. Fire is a natural process in these ecosystems; but there is a need to balance the natural process with the risk of fire destroying homes.

3) Outcome: The standards would not apply to fuel treatments within the WUI as defined by HFRA.

   Discussion: The team evaluated various options regarding where the standards should be applied and they used a variety of criteria to evaluate which option to carry forward for detailed consideration. The criteria included: 1) is there a defined area; 2) can effects be meaningfully evaluated; 3) would it provide for community protection; and 4) does it meet the purpose and need. (For further detail see Alternative development section – alternatives considered from July 29, 2004 through February 24, 2005 in the project file). The following summarizes the options and considerations:

   a. *Not applying the vegetation standards to fuel treatment projects within ¼ mile of communities.* This option provides a defined area which could be meaningfully evaluated and it meets the purpose and need. However, in some cases it may not provide for community protection because this option would not fulfill the need to break up the continuity of fuels and or to reduce fire spread by creating fuel breaks (USDI USDA 2006).

   b. *Not applying the vegetation standards to fuel treatment projects within ½ mile of an at-risk community.* This option provides a defined area which could be meaningfully evaluated and it meets the purpose and need. However, in some cases it may not provide for community protection because this option would not fulfill the need to break up the continuity of fuels and or to reduce fire spread by creating fuel breaks.

   c. *Not applying the vegetation standards to fuel treatment projects within completed Community Wildfire Protection plans.* Each Community Wildfire Protection plans defines the WUI area for their area. However, not all communities have completed their plans. This option was dismissed because it did not have a defined area – or one that could be easily mapped; therefore it would be difficult to evaluate effects. In addition, fuel treatment projects would not be exempted for those communities who had not

completed a Community Wildfire Protection plan; therefore it would not meet criterion number 3.

d. *Not applying the vegetation standards to fuel treatment projects within 1 mile of a boundary of an at-risk community, interface community or intermix community.* This option meets all the criteria because it contains a defined area where effects can be meaningfully evaluated. In most cases it would allow fuel treatments to reduce fuels around communities and it would meet the purpose and need. This option was dismissed from detailed consideration because instead it was combined with option (e) below.

e. *Not applying the vegetation standards to the WUI as defined by HFRA - with a limit not exempting projects on more that 6 percent of lynx habitat and add Guideline VEG G10.* The team discussed how to define WUI and decided to use the definition established by Congress in the HFRA as it established a *national procedure* for determining the extent of the WUI (USDI, USDA FS 2006). The team used the analysis from option (d) to limit the amount of fuels treatment projects which could be exempted. (In the Northern Rockies six percent of lynx habitat is within one mile of the boundary of an at-risk community, interface community or intermix community). This option addresses all the criteria: (1) it has a defined area (WUI as defined by HFRA); (2) it can be meaningfully evaluated (limits exemption to six percent of lynx habitat; (3) provides for community protection; and (4) meets the purpose and need by incorporating management direction into plans to address the quantity and quality of lynx habitat although it would allow for adverse effects to occur on up to six percent of lynx habitat.

Guideline VEG G10 is only found in Alternative F. It recommends that fuel treatment projects within the wildland-urban interface should be designed *considering* Standards VEG S1, S2, S5, and S6. The intent in adding this guideline is that although the vegetation standards do not apply to fuel treatment projects within the WUI as defined by HFRA, these projects should still consider the standards in the development of the proposal. In many cases projects can be designed to reduce hazardous fuels while providing for lynx needs. This guideline ensures lynx are considered in the project design – but allows for the flexibility of not meeting the standards in situations where meeting the standards would prevent the project from reducing the hazardous fuels.

Grazing

Livestock grazing may reduce or eliminate foraging habitat in areas that grow quaking aspen and willow in riparian areas (LCAS). These localized changes in habitat may affect individual lynx; however, no information indicates that grazing poses a threat to overall lynx populations (Appendix P, p. 40083). Grazing was not mentioned in

the original listing decision as a threat to lynx, nor is it discussed in *the Ecology and Conservation of Lynx in the United States* (Ruggiero et al. 2000a).

In ***Alternative B, Standards GRAZ S1, GRAZ S2, GRAZ S3, and GRAZ S4*** provide management direction for grazing in fire and harvest created openings, aspen stands, riparian areas and willow carrs, and shrub-steppe habitat. Alternatives C and D retain the management direction as standards. Alternative E changes the management direction to Guidelines GRAZ G1, GRAZ G2, GRAZ G3, and GRAZ G4 because neither the Remand Notice nor the *Ecology of Conservation of Lynx in the United States* recognized grazing as a threat to lynx.

Many people commented on Alternative E, the preferred alternative in the DEIS, and said the guidelines should be standards in the final alternative. Others said grazing should not be allowed at all, while two said the grazing guidelines should be retained. The FWS did not comment on the level of grazing management direction in Alternative E.

All the action alternatives address the LCAS grazing risk factors in Standards GRAZ S1 through GRAZ S4 or Guidelines GRAZ G1 through GRAZ G4. They provide management direction for livestock grazing that would retain winter snowshoe hare habitat, including aspen, willow, riparian areas, and shrub-steppe. Since the LCAS risk factors were addressed in all action alternatives, the ID team decided an alternative that prohibited grazing was not necessary. Prohibiting grazing also would not meet the Purpose and Need of maintaining the overall multiple-use direction in existing plans.

The ID team reevaluated whether or not the management direction in the final alternative should be in the form of standards or guidelines. No new information surfaced which indicates grazing is a threat to lynx populations; therefore Alternative F retains the management direction for grazing as guidelines. The guidelines ensure projects consider lynx habitat needs in their design and only when warranted may they deviate.

Add standards and guidelines to direct when and where wildland fire should be allowed to burn

The 1999 BA found suppressing wildfire might limit its role in creating winter snowshoe hare habitat, thus contributing to the risk of adverse effects on lynx (Hickenbottom et al. 1999, p. 69-70). Some people said none of the standards addressed fire suppression. They said the analysis should recognize the vital role of natural fire, which should be allowed to burn when it occurs.

All the action alternatives encourage using fire where winter snowshoe hare habitat is limited. Objective VEG O3 says to conduct fire use activities to restore ecological processes and maintain or improve lynx habitat. Guideline VEG G1 says vegetation management near denning habitat should be planned to recruit and

maintain winter snowshoe hare habitat where it is scarce, unavailable, or declining.

Where fire suppression does occur in lynx habitat, it can reduce the quality of habitat by reducing the amount of young forests or by changing species composition and structure of forests (LCAS, p. 2-6; Appendix P, p. 40094).

Many existing plans allow using wildland fire in *non-developmental allocations* – places where natural disturbance processes predominate, such as wilderness and roadless areas (Hickenbottom et al. 1999, p. 67). Most direct aggressive fire suppression in *developmental land allocations*, places where campgrounds and active management like timber sales are allowed (Hickenbottom et al. 1999, p. 69).

Changing plans to allow natural fires would require evaluating each area to see where, when, and under what conditions natural fires should be allowed. This would expand the scope of the Purpose and Need, Proposed Action, and alternatives.

The ID team decided the decision about where to let natural fires burn would be best evaluated at the local level, so local conditions could be considered. The existing alternatives encourage using natural fire, but leave the decision about when and where to the responsible local officials.

Climate Change

Some people said we should consider the effects of climate change on lynx habitat and whether or not additional management direction should be developed to address this concern.

Vegetation dynamics, disturbance, climate, and their interactions are key elements in predicting the future condition of ecosystems and landscapes and the vulnerability of species and populations to climatic change. Climatic factors such as temperature, precipitation, and wind patterns are among the many factors that influence vegetative structure and composition, fire behavior, and wildlife habitat, including lynx habitat. Lynx have a competitive advantage in deep snow habitats that are common throughout the northern Rockies. Climate change, therefore, has potential to affect factors that influence lynx and their habitat in the northern Rockies.

The paper *Climate change science – An analysis of some key questions* (Cicerone et al. 2001) elaborated on the topic of global warming. There is little scientific disagreement that global warming is occurring at an accelerating rate and that human activities (greenhouse gas emission increases, etc.) have contributed to this phenomenon. Some uncertainty exists as to the magnitude of these effects in relation to natural variation and the precise effects of how feedback mechanisms (increased water vapor, reduced snow cover) influence the extent and magnitude of global warming patterns and trends. More

recently, the extensive *Arctic Climate Impact Assessment* (2004) has provided compelling evidence that among numerous other effects (1) arctic climate is now warming more rapidly than the rest of the earth, (2) much larger changes are projected in the future, and (3) arctic warming and its consequences have worldwide implications.

Other indirect effects of global warming may have beneficial or detrimental effects on lynx. A recent study of the effect of climatic change on wildfire in the western U.S. (McKenzie et al. 2004) determined that with warming climate fire seasons would likely be extended and that total area burned is likely to increase. As a result significant changes in the distribution and abundance of dominant plant species in some ecosystems may occur. Some species that are sensitive to fire may decline, whereas the distribution and abundance of species favored by fire may be enhanced. Stand replacing fires are a common occurrence throughout much of lynx habitat and often provide conditions conducive to producing good quality snowshoe hare habitat.

It appears likely that climate change may affect lynx over the long term by altering the extent of deep snow habitats preferred by lynx. Kerr and Packer (1998) used the general circulation model developed at the Goddard Institute of Space Sciences for the Intergovernmental Panel on Climate Change to predict future mammal diversity patterns in Canada. Based upon their analysis they predicted that at least 25 mammal species, including Canada lynx, are limited by the Arctic Ocean in their ability to disperse northward and are likely to undergo significant losses of habitat (Keer and Packer 1998). Features of the snow may also influence lynx interaction with snowshoe hare. Stenseth et. al. (2004) have shown that large-scale climatic fluctuations can influence lynx population biological patterns. Since the effects of global warming are occurring over relatively long periods, the effects on lynx over the short term (10-15 years) are less clear. More focused research is needed on the effect of climate change on specific threatened and endangered species such as the Canada lynx, to more accurately predict specific effects of climate change in the northern Rockies.

In summary, there is incomplete or unavailable information upon which to base any more detailed analysis of climate change risk factors for the lynx. The best available information does provide some evidence that climate change poses risks, but the exact nature of these risks remains uncertain. In addition, it is unlikely the effects of climate change would substantially alter lynx habitat over the next decade or two and since the effects are unknown it is premature to include additional management direction at this time. Standard VEG S1 addresses the quantity of winter snowshoe hare habitat, whether created by wildland fire or timber harvest.

Management direction related to human uses

Over-the-snow winter recreation

Lynx have very large feet in relation to their body mass, providing them a competitive advantage over other carnivores in deep snow. Various reports and observations have documented coyotes using high elevation, deep snow areas (Buskirk et al. 2000a). Coyotes use open areas because the snow is more compacted there, according to research conducted in central Alberta (Todd et al. 1981). In another study in Alberta, coyotes selected hard or shallow snow more often than lynx did (Murray et al. 1994). Related research is currently underway in northwestern Montana, northern Utah, and north-central Washington (see Appendix F).

In ***Alternative B, Standard HU S1*** would maintain the existing level of groomed and designated routes. All action alternatives contain Objectives HU O1 and HU O3 that discourage expanding snow-compacting human activities. Alternatives B, C, and D contain Standard HU S1 that would allow existing over-the-snow areas to continue but not grow. Alternative E, the DEIS preferred alternative, contains Guideline HU G11 that discourages the growth of designated over-the-snow route and play areas. All alternatives would allow existing special use permits and agreements to continue.

Some people asked that no dispersed over-the-snow use be allowed off groomed or designated trails and areas, saying the no net increase in groomed or designated routes did not go far enough. Others said the management direction should be in the form of a standard, not a guideline.

Some people said standards related to over-the-snow use should be removed. They said there is no evidence to show that coyotes and other predators use packed snow trails to compete with lynx for prey, and that amount of compaction created by snowmobiles is insignificant compared to the compaction created naturally by the weather. They were particularly concerned that if such language was introduced into plans, it could be difficult to change, incrementally restricting the places where snowmobiling is allowed. Others wanted an allowance made to increase use.

The FWS agreed that it is prudent to maintain the status quo and restrict expansion of over-the-snow routes until more information is available because of the possibility that, over time, unregulated expansion could impair further conservation efforts. They also said current, ongoing research in Montana may shed some information on the effects of snow compaction on lynx. They suggested careful consideration of the most recent information and the reality of possible impairment of options for the future. They suggested considering language that could provide more guidance on conditions where the expansion of over-the-snow routes would be warranted and acceptable.

The ID team reviewed the results of research conducted since the DEIS was released. Within lynx habitat in northwestern Montana, twelve radio-collared coyotes were monitored over three winter seasons to assess how coyotes interacted with compacted snowmobile trails (Kolbe 2005). Coyotes remained in lynx habitat having deep snow conditions and traveled on compacted snowmobile trails more than expected. However, coyotes used compacted snowmobile trails for less than eight percent of their travel and used compacted and uncompacted roads similarly (Kolbe 2005). Coyotes did strongly select for shallower and more supportive snow surfaces when traveling off of compacted trails. In this study coyotes primarily scavenged ungulate carrion that were readily available while snowshoe hare kills comprised only three percent of coyote feeding sites (Kolbe 2005).

In the Uinta Mountains of northeastern Utah and three comparative study areas (Bear River range in Utah and Idaho, Targhee NF in Idaho, Bighorn NF in Wyoming) Bunnell (2006) found that the presence of snowmobile trails was a highly significant predictor of coyote activity in deep snow areas.

From track surveys it was determined that the vast majority of coyotes (90 percent) stayed within 350 meters of a compacted trail and that snow depth and prey density estimates (snowshoe hares and red squirrels) were the most significant variable in determining whether a coyote returned to a snowmobile trail (Bunnell 2006). Of the four study areas recent lynx presence has only been documented on the Targhee NF.

These recent studies reaffirm the following findings: there is no conclusive evidence that demonstrates that coyote competition is currently negatively affecting lynx populations.

The Listing Decision stated,

> *… the variability of snow conditions and frequency of fresh snows in the winter habitats that support lynx, continually reduce or alter the availability of snow trails and shallow snow depths used by coyotes in lynx habitat, making it more difficult for coyotes to effectively hunt in these areas regularly during the winter.*

The 2000 Biological Opinion stated,

> *Additional information needs on the interrelationships between lynx and other carnivores during deep snow periods, and the influence of compacted snow routes on interspecific competition are identified in the LCAS. While dietary overlap suggests the possibility of competition between coyotes and lynx (Staples 1995, O'Donoghue et al. 1998), there are no data available that demonstrate that coyote competition is currently negatively affecting lynx populations. The LCAS would limit the expansion of winter dispersed recreation activities in lynx habitat until more conclusive information is available.*

The FWS Remand Notice (Appendix P) states,

> *Despite the lack of evidence that competition with any species is negatively affecting lynx, the final rule expanded the theory that ski and snowmobile trails and roads that are maintained for winter recreation and forest management create packed snow corridors that give other species, particularly coyotes, access to lynx winter habitat on all land ownerships. This theory has neither been proven or disproven at this time (Roe et al. 2001)...Because no evidence has been provided that packed snowtrails facilitate competition to a level that negatively affects lynx, we do not consider packed snowtrails to be a threat to lynx at this time.*

Based on this information, the ID team reevaluated management direction related to over-the-snow activities. An alternative to prohibit all snow-compacting activities or to limit dispersed use was evaluated, but not considered in detail because current research indicates this level of management direction is unwarranted (USDI FWS 2000a; Appendices O and P).

An alternative to drop all direction limiting snow compaction was not developed in detail because there is evidence competing predators use packed trails, suggesting a potential effect on individual lynx. The ID team decided it was prudent to maintain the status quo and not let over-the-snow routes expand. However, the ID team also decided it was reasonable to retain the direction as a guideline in Alternative F. The intent is to follow the management direction in guidelines. However, there may be some cases where expansion of over-the-snow routes would be warranted and acceptable, or where research indicates there would be no harm to lynx. Guidelines are better suited to adaptive management.

There is also no basis to establish any particular threshold of allowable increases. However, alternative language has been developed that would allow expanding winter recreation in some places where heavy public use existed in 1998, 1999, or 2000. Such increases are addressed in Standards HU S1 in Alternatives C and D, and Guideline HU G11 in Alternatives E and F.

Some people said winter logging has negatively affected lynx so it should be limited. They said the alternatives should provide the flexibility to rule out winter logging in sensitive lynx habitat.

The management direction does not specifically address winter logging. The management direction does address logging (VEG Objectives, Standards, and Guidelines) and road use (Objective HU O6 and Guidelines HU G6, G7, G8, G9). Winter logging is often used to reduce effects on soils or to other species such as grizzly bears. Timber sale contracts identify which roads may be used for access.

Winter logging could affect lynx by providing access to competitors using

plowed roads. Generally, such access takes place for just one or two seasons on a given route. Snowmobile use tends to be more consistent from year to year.

Effects of winter logging are even more speculative than for regularly compacted trails. The ID team decided that site-specific designing of access to timber sales at the project level could take lynx needs into account and minimize effects, so there was no need to ban or otherwise specifically address winter logging.

Ski areas

The LCAS identified risk factors associated with ski areas, including *short-term effects* on denning, foraging, and diurnal security habitat and *long-term effects* on movement within and between home ranges (LCAS, p. 2-10). Ski areas may eliminate habitat and pose a threat to movements; but most were constructed before lynx became a conservation issue (Hickenbottom et al. 1999, p. 70). Mitigation measures can be developed at the project level to lessen the effects of existing developments.

In ***Alternative B, Objectives ALL O1, HU O2, HU O3, and HU O4; Standards ALL S1 and HU S2; and Guidelines HU G1, HU G2, HU G3, and HU G10*** provide management direction about ski area development, expansion, and operations to provide for lynx movement, security, and habitat needs.

Alternative C, D, and E change Standard HU S2 to Guideline HU G10. Standard HU S2 requires diurnal habitat to be maintained, if needed. In most cases diurnal habitat can be provided outside the ski area, especially those areas where there is only one ski area per mountain range. Since the need to provide diurnal habitat is only found in a few places in the northern Rockies, the ID team determined it was better suited as a guideline.

Some people said ski areas should be removed or at least prevented from expanding. Others recommended the final preferred alternative retain Standard HU S2.

FWS did not comment on this change. There is no information that indicates removal of ski areas is warranted, nor limiting their expansion, as long as lynx needs are considered. The ID team also determined that since ski areas are dispersed across the northern Rockies the management direction for providing diurnal habitat should be retained as a guideline.

Mineral and energy development

The LCAS said the main risk factors associated with minerals and energy development is related to the potential for plowed roads to provide access for lynx competitors.

In ***Alternative B, Objectives ALL O1, HU O1, and HU O5, Standards ALL S1 and HU S3, and Guidelines HU G4, and HU G5*** provide management direction for mineral and energy development. Standard HU S3 says to keep mineral and energy development to designated routes. This standard was changed to Guideline HU G12 in Alternative E.

Some people said lease stipulations identifying constraints on developing oil & gas, coal, or geothermal resources should be one of the decisions made as a part of the management direction. One commenter said the management direction in HU S3 should be retained as a standard.

The scoping proposed action contained a guideline that said stipulations should be developed at the leasing stage to limit the timing of activities and surface use and occupancy for actions proposed in lynx habitat. Alternative B, the Proposed Action, does not include similar language, nor do any of the other alternatives.

The main effects of leases and mines on lynx are related to the potential for plowed roads to provide access for lynx competitors, particularly coyotes (LCAS). In the planning area, about 39 wells or well pads are predicted to be developed over the next ten years; most of them on the Bridger-Teton National Forest (see the *Minerals* section in Chapter 3).

To address the risk of providing access to competitors, the action alternatives contain direction restricting mineral access to specified routes, encouraging remote monitoring, developing reclamation plans, and managing public access. See Standard HU S3 and Guideline HU G4. This direction applies to areas already leased.

When an energy-related project is proposed on leased lands, the lessee must obtain approval from the BLM and FS for any activities, even though the lessee has legal rights to develop. All leases include a standard term (Sec 6. of Lease Terms) that says the "lessee shall conduct operations in a manner that minimizes adverse impacts to the land, air, and water, to cultural, biological, visual, and other resources..." Before any disturbance may take place, surveys or studies may be needed to find the extent of impacts to other resources. If in the conduct of operations threatened or endangered species are observed the lessee shall immediately contact the lessor, and the lessee shall cease any operations that would result in the destruction of such species (cite in project file). Standard lease terms say drilling operations can be moved either in place - up to 200 meters, or in time - up to 60 days (43 CFR 3101.1-2).

An ID team would review the existing lease terms and the existing plan, as amended, to find if any further site-specific resource protection measures should be applied as conditions of approval for the surface-use plan of operations. The management direction in the plan, as amended by the chosen alternative would be applied as conditions of approval, where appropriate, for new drilling permits.

The standard terms allow timing and location adjustments to be made where needed and all action alternatives address the risk of providing access to lynx competitors. Mineral activities are not widespread, are subject to laws and regulations, and are not considered a threat to lynx populations as a whole (USDI FWS 2000a, and Appendix P). Their effects are appropriately evaluated

and mitigated at the project level. In light of the existing guidance and constraints on leased minerals, the lynx ID team recommended that no further lease stipulations were needed to provide for the conservation and recovery of lynx. Therefore, the language in the scoping proposed action was dropped, and an alternative to specifically include lease stipulations was not considered in detail.

The management direction requiring use of only designated routes was kept as a guideline in Alternative F, to be consistent with other similar management direction for over-the-snow recreation.

Roads

Little information is available about the effects of roads and trails on lynx or its prey (Apps 2000; McKelvey et al. 2000d). Roads may reduce lynx habitat by removing forest cover. Along less-traveled roads where the vegetation provides good hare habitat, sometimes lynx use the roadbeds for travel and foraging (Koehler and Brittell 1990; LCAS, p. 2-12).

Roads and trails facilitate human use during winter. Snow compaction on roads and trails may give competing carnivores winter access into lynx habitat (Buskirk et al. 2000a), a concern addressed in Standards HU S1 and HU S3, and Guidelines HU G11 and HU G12.

Although many species of wildlife are disturbed when forest roads are used (Ruediger 1996), preliminary information suggests lynx do not avoid roads (Ruggiero et al. 2000a) except at high traffic volumes (Apps 2000). In denning habitat, when roads are used during summer, lynx may be affected if they move their kittens to avoid the disturbance (Ruggiero et al. 2000b; LCAS, p. 2-12).

A recent analysis on the Okanogan NF in Washington showed lynx neither preferred nor avoided forest roads, and that the low road density in the study area did not appear to affect lynx habitat selection (McKelvey et al. 2000c; USDI FWS 2000a, p. 39). This analysis did not address potential indirect effects on habitat quality.

Alternative B – as well as Alternatives C, D, and E contain management direction that would minimize snow compaction in new places in lynx habitat and provide for habitat connectivity. The direction is found in ***Objectives ALL O1, HU O1, and HU O6; Standards HU S1, HU S3, and LINK S1, and Guidelines ALL G1, HU G4, HU G6, HU G7, HU G8, HU G9, HU G11, and HU G12.***

Some people said more restrictions on roads were needed to conserve lynx. They wanted new road construction halted, road densities identified and existing roads closed or eliminated, or they wanted the roads guidelines turned into standards.

Other people said there should be no road-related standards or guidelines, saying no evidence exists that roads harm lynx. Some people said Guideline HU G9 should be deleted because there are no compelling reasons to close roads.

The ID team reviewed the LCAS and other literature, including the FWS Remand Notice (Appendix P), and found no information indicating road building should be banned or that further restrictions were needed. The standards and guidelines adequately address the known risks associated with roads.

The ID team also evaluated whether the road-related guidelines should be made into standards. The ID team determined guidelines were the appropriate level of management direction because roads have not been found to be a threat to lynx populations. Some management direction is warranted because roads may affect individual lynx.

The ID team also evaluated whether an alternative should be developed that dropped all road-related guidance. Alternative A covers this, and the available information indicates some direction is needed to make sure lynx needs are considered in road management decisions; therefore, a separate alternative to drop road-related direction was not considered in detail. The ID team did change the emphasis of Guideline HU G6 in Alternative B from prohibiting road upgrades to mitigating the effects in Alternatives C, D, E, and F.

Some people asked for a standard limiting the density of roads.

The density of roads does not appear to affect lynx habitat selection. On page 2-12, the LCAS said there was no compelling evidence to suggest managing road densities was necessary to conserve lynx.

All alternatives contain Guideline HU 9, which says public use should be restricted on new roads. New roads are to be decommissioned after use if they are not needed for other reasons.

The scoping proposed action included a guideline to prioritize reducing road densities in lynx habitat. This guideline was dropped from the DEIS Proposed Action, Alternative B, because in 2000, the Roads Analysis policy was adopted at 36 CFR 212.5(2). This new federal regulation says all FS road systems must be evaluated based on their environmental effects to see whether they should be kept or decommissioned. Therefore, the guideline is no longer needed.

The ID team decided not to consider a road density standard in detail because there is no compelling evidence it is needed. Guideline HU G9 provides direction on new roads, and the Roads Policy requires reviewing existing roads.

Highways

Highways impact lynx by fragmenting habitat and impeding movement. As traffic lanes, volume, speeds, and rights-of way increase, the effects on lynx are increased. As human demographics change, highways tend to increase in size and traffic density.

In ***Alternative B, Objective ALL O1 and Standard LINK S1*** are designed to maintain linkage and habitat connectivity by identifying highway crossings.

Alternatives C, D, and E also have the same objective and standard.

Some people said more should be done than just identifying highway crossings. FWS did not comment on management direction related to highways.

The LCAS recommended project standards for highways. It says to "Identify, map and prioritize site-specific locations, using topographic and vegetation features, to determine where highway crossings are needed to reduce highway impacts on lynx and other wildlife". Alternatives B, C, D, E and F include Standard LINK S1 which reflects the intent of the LCAS recommendations. In addition, Guideline ALL G1 says "Methods to avoid or reduce effects on lynx should be used when constructing or reconstructing highways or forest highways across federal land. Methods could include fencing, underpasses or overpasses."

As noted in Chapter 3, Transportation Section, portions of three highways are likely to be reconstructed in linkage areas in the next ten years. Each state agency, Wyoming, Idaho and Montana are incorporating wildlife crossing into their highway design packages (Wyoming Department of Transportation, 2005; Idaho Transportation Department 2004; Montana DOT, FHWA, Confederated Kootenai and Salish Tribes 2006). Therefore no further management direction regarding wildlife crossings in the form of standards was found to be warranted.

Other suggestions

Prohibit logging in lynx travel corridors

Some people said logging should not be allowed in lynx travel corridors.

Studies of lynx and snowshoe hare have documented lynx presence and reproduction and snowshoe hare abundance in a variety of managed landscapes (Appendix P). While it is assumed lynx would prefer to travel where there is forested cover, the literature contains many examples of lynx crossing large, unforested openings (Roe et al. 2000).

In the northern Rockies, lynx habitat occurs at higher elevations and, therefore is naturally fragmented by topography into island-like patches (McKelvey et al. 2000b). Lynx cross intervening landscapes, made up of shrub-steppe, grassland, low-elevation forested, or unforested valleys, and in some cases, desert, to reach these habitat islands (Appendix P).

Retaining vegetation to provide cover for lynx and habitat for prey is desirable. For those plans already amended by INFISH (Inland Native Fish Strategy) and PACFISH (Interim Strategy for Managing Anadromous Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California), management direction exists to retain riparian habitat and provide for connectivity (Hickenbottom et al. 1999, p.71).

Logging units can be designed to provide cover or movement corridors

between blocks of lynx habitat. The action alternatives include Standard ALL S1, which requires logging to maintain habitat connectivity.

The ID team evaluated this concern and determined that the action alternatives already included a standard to maintain habitat connectivity. No compelling evidence has been presented to show logging in travel corridors effects lynx, so an alternative prohibiting it is not warranted.

Establish only objectives for lynx management, not standards

Some people would like all the proposed management direction to be objectives. They said standards should not be established because there is so little information about lynx.

Objectives describe desired resource conditions. Standards are required management actions that tell resource managers how to achieve the objectives; standards can include requirements to refrain from taking action in some situations.

Much of the reason the management direction is needed is that existing plans fail to reduce or eliminate the adverse effects of land management activities on lynx. Lynx was listed by the FWS as a threatened species because of the lack of management direction in existing plans. The 1999 BA found existing plans were likely to adversely affect lynx because of the lack of management direction.

Adding more objectives would not answer this need because objectives only describe desired conditions. Standards provide greater assurance that the desired conditions would be met; they are better regulatory mechanisms. Standards describe what the limits are for activities and the sideboards for management.

The ID team evaluated this comment, and decided that establishing only objectives would not meet the Purpose and Need.

Apply lynx conservation measures to areas that have not been mapped as lynx habitat

Some people wanted the proposed management direction to be applied to areas that have not been identified as lynx habitat.

Alternative B would apply management direction to lynx habitat identified at the time a project is proposed – see Chapter 1.

The criteria for identifying lynx habitat were developed in the LCAS (pp. 4-8 to 4-11) based on snow conditions, vegetation types, and the verified historical distribution of lynx as described in the Ruggiero et al. 2000a (see FEIS Appendix B).

To be considered lynx habitat, an area must be able to support the type and arrangement of vegetation that sustains enough snowshoe hares, and experience the deep snow winters where lynx have a competitive advantage (Appendix P). Landscapes with these characteristics are considered capable of providing habitat components adequate for lynx to persist over time.

While lynx sometimes may occur in areas outside of lynx habitat, it is

unlikely that those areas provide what lynx need to persist over time. No scientific basis has been offered for applying lynx conservation measures to habitats other than those described in the LCAS. There is no basis to conclude that applying the measures to other habitats would provide any additional benefits to lynx. Consequently, no alternatives have been developed to expand where management direction would be applied.

During site-specific project analysis, maps of lynx habitat would be reviewed and updated based on local information. In addition, ESA requires that adverse effects on lynx must be addressed whenever projects may affect them. Future plan amendments or revisions may also consider lynx and information about local lynx presence as appropriate. However, at this time and at the broad scale of this proposal, there is no basis for directing the conservation measures to apply to anything but the lynx habitat identified using the existing criteria.

Apply the management direction only to occupied lynx habitat

The ID team considered whether to develop alternatives to apply the management direction only to occupied lynx habitat rather than to all identified lynx habitat. In the DEIS, the ID team said the management direction should apply to all habitats that could support lynx. The ID team reevaluated this recommendation based on public comments received on the DEIS and new information since the DEIS.

Some people asked that the direction apply only to occupied habitat (places where the presence of lynx has been proven) and areas likely to sustain lynx.

When the DEIS was issued in January 2004 no information was available regarding which units were considered occupied or unoccupied by lynx or what areas were needed to sustain lynx.

In May of 2005 the FS and FWS signed a new *Canada Lynx Conservation Agreement* (USDA FS, USDI FWS 2005) to replace the 2000 Conservation Agreement, which had expired. The 2005 agreement only applied to NFS land mapped as occupied lynx habitat, and was only in force until the forest plans were amended or revised to conserve lynx. The agreement also said the agencies would work together to identify occupied habitat.

The *Amendment to the Conservation Agreement*, dated May12, 2006, between the FS and FWS defined occupied habitat on national forests in the northern and southern Rocky Mountains and the Cascade Range (Forest Service Region 1, 2, 4 and 6). (Note: The conservation agreement was reissued in October 2006 with an extend expiration date).

All lynx habitat on an entire national forest is considered "occupied" by lynx when:

1. There are at least two verified lynx observations or records since 1999 on the national forest unless they are verified to be transient individuals; or

2. There is evidence of lynx reproduction on national forest.

Based on these considerations twelve national forest units within the planning area are considered occupied; six are not - see Table 1-1 and Appendix C. Several disjunct mountain ranges on the Custer, Gallatin, Helena and Lewis and Clark NFs are also considered unoccupied.

In November 2006, the FWS designated critical habitat for the Canada lynx (USDI FWS 2006). In its listing it defines critical habitat as (i) the specific areas within the geographical area occupied by a species, at the time it is listed in accordance with the Act, on which are found those physical or biological features (I) essential to the conservation of the species and (II) that may require special management considerations or protections; and (ii) specific areas outside the geographical area occupied by a species at the time it is listed, upon a determination that such areas are essential for the conservation of the species. Conservation is a process which contributes to improving the status of a species.

The final rule did not include NFS lands covered by a conservation agreement for lynx, which includes portions of the Flathead, Helena, Idaho Panhandle, Kootenai, Lewis and Clark, and Lolo National Forests. These units meet criterion (I) above; however they did not meet criterion (II) because the FS is following the conservation agreement which says to consider the LCAS when designing projects or activities. These units do not reflect all units that are occupied by lynx. Other units, including the Targhee, Custer, Gallatin, Bridger-Teton, and Shoshone National Forests are occupied but were not considered for designation as critical habitat. None of the unoccupied units, the Nez Perce, Salmon-Challis, Beaverhead-Deerlodge, Bitterroot, Ashley or Bighorn NFs - or the disjunct mountain ranges on the Custer, Gallatin, Helena and Lewis and Clark NFs– were considered for critical habitat.

In addition to the critical habitat listing, the FWS also issued a *Recovery Outline* in 2005 (USDI FWS 2005a). The outline identifies *core, secondary* and *periphery* habitat. *Core* areas include areas with the strongest long-term evidence of persistence of lynx populations within the contiguous United States. Core areas have both persistent verified records of lynx occurrence over time and recent evidence of reproduction. There are no unoccupied units that have been identified as core.

The *Recovery Outline* says, "Focusing lynx conservation efforts in these core areas would ensure the continued persistence of lynx in the contiguous United States by addressing fundamental principles of conservation biology." It goes on to say "Recovery of lynx will be achieved when conditions have been attained that will allow lynx populations to persist long term in each of the identified cores areas".

Secondary areas are those with historical records of lynx presence with no record of reproduction; or areas with historical records and no recent surveys to

document the presence of lynx and/or lynx reproduction. If future surveys document presence and reproduction in secondary areas, the area could be elevated to core. Secondary areas may support lynx during dispersal movements or other periods, allowing animals to then return to core areas.

Four of the National Forests that are unoccupied are considered secondary habitat. One unit, the Nez Perce NF had not been surveyed for lynx presence but is currently being surveyed. Based on the survey efforts the Nez Perce NF would either be identified as occupied or remain as unoccupied.

In *peripheral areas* the majority of historical lynx records are sporadic and generally corresponds to periods following cyclic lynx population highs in Canada. There is no evidence of long-term presence or reproduction that might indicate colonization or sustained use of these areas by lynx. Two units, the Bighorn and Ashley National Forests, and the disjunct mountain ranges on the Custer and Lewis and Clark have been identified as peripheral habitat. None of these areas are occupied at this time.

Based on this new information and to be responsive to comments the ID team determined it would be reasonable to consider an alternative that only applies the management direction to occupied habitat. All core areas are occupied and these are the areas which have been identified as necessary to sustain lynx.

Therefore, the ID team decided to evaluate Alternative F under two scenarios: (1) management direction would be incorporated into all forest plans and would apply to all mapped lynx habitat, whether or not occupied; and (2) management direction would be incorporated into all forest plans but would only apply to occupied habitat. Under scenario 2, the direction would be "considered" for unoccupied units, but would not have to be followed until such time as lynx occupy the unit.

Move lynx into unoccupied habitat

Some people said the proposal should propose transplanting lynx into unoccupied habitat.

Transplanting is outside the scope of the Purpose and Need to manage habitat to conserve lynx; therefore, this comment was not considered in further detail.

Restrict hare hunting

Some people said the proposal should restricting hare hunting.

The states regulate hunting. Regulating hunting is outside the authority of the FS, which is a federal land management agency. Therefore, the ID team did not consider this comment in further detail.

Include all the recommendations in the LCAS

People said some requirements in the LCAS were missing from the scoping proposed action.

The ID team rearranged the LCAS recommendations to match the format of land management plans. Some recommendations from the LCAS were not included in the alternatives because they were instructions about how to map lynx habitat, they were

descriptions of an analysis process, or they were already required in existing plan direction. FEIS Appendix A is a crosswalk between the LCAS, and the scoping proposed action, the DEIS/FEIS Proposed Action (Alternative B), and Alternative F, the FEIS preferred alternative. Appendix A displays what recommendations were put into Alternative B, what recommendations from the LCAS were not included in the proposal, and explains why they were not included.

Include an alternative that: 1) prohibits grazing; 2) prohibits snowmobiles; 3) does not let ski areas expand one more foot; 4) bans road construction; 5) bans loggers and mining and oil and gas leases; and 6) bans hunting.

A few people wanted an alternative that closed the public land to most uses.

Many of these prohibitions were considered individually, but not in detail (see previous discussions in this section). The Purpose and Need for the proposed proposal is to incorporate management direction that conserves and promotes recovery of Canada lynx by reducing or eliminating adverse effects from land management activities on NFS lands, **while** still preserving the overall multiple-use direction in existing plans (FEIS, p. 1). Banning or prohibiting many of the activities on federal land is beyond what is necessary to conserve lynx, and would not preserve the overall multiple-use direction in existing plans. Therefore, the ID team did not consider this comment in further detail.

Consider a standard that requires engaging in spatially explicit landscape planning within very large management areas and is conservative in retaining habitat components.

One person wanted a standard requiring the units to do landscape planning.

The standards and guidelines in the alternatives were developed to address the risk factors to lynx identified in the LCAS.

The ID team reviewed this comment and determined there is no reason to compel a unit to do landscape planning because planning, in and of itself, does not address the risk factors.

The standards and guidelines do not prohibit nor compel a forest to do landscape planning. However, in Standard VEG S1 landscape planning may be used to modify the 30 percent requirement. Also, as noted in the discussion on VEG S1 on page 71 to 73 FWS was concerned about expanding the area of analysis beyond one LAU. Therefore, the ID team decided not to consider this in further detail.

Other concerns

People asked other questions in their scoping letters and in the comments on the DEIS that were not about the effects of the management direction.

Resource topics

People were concerned about the effects of Alternative B and the other action alternatives on various resources, including:

- *Other wildlife*
- *Range management*
- *Recreation*
- *Developing and exploring for minerals*
- *Economic well-being*
- *Social concerns*

The effects on these resource topics are discussed in Chapter 3, but did not lead to developing other alternatives.

Why was lynx listed as a threatened species?

The Listing Decision is not the responsibility of the FS. FWS is the agency responsible for listing decisions. They made the decision to list lynx based on several criteria included in ESA. On March 24, 2000, the FWS decided lynx should be listed as a threatened species because of the lack of guidance to conserve lynx in existing National Forest Land and Resource Plans (Appendix O).

Once a species is listed under ESA, federal land management agencies, such as the FS are responsible to make sure their actions are not likely to jeopardize the continued existence of that species, or to result in destroying or unfavorably changing its habitat. We are required to conserve the species, to take steps to eliminate or reduce the risk factors that led to the species being listed.

What is the scientific basis for the Proposed Action?

Proposed Action, Alternative B, is based on the conservation recommendations identified in the LCAS (Ruediger et al 2000). A team of biologists from FS, BLM, FWS, and the National Park Service developed the LCAS. They evaluated the scientific information available about lynx and its prey and the habitat needs of both.

In the LCAS, literature was cited to support management recommendations. For many issues, little information existed. In these cases, assumptions or inferences were made based on the collective experience and professional judgment of the team members in consultation with other lynx experts. The rationale was documented in the LCAS in these situations.

Most lynx research has been conducted in Alaska and Canada, with a small but growing number of studies completed in the contiguous United States, which contains the southern portion of lynx range. Most research has focused on demographics and ecology, with little emphasis on management, except for regulating trapping quotas.

At the time the LCAS was being developed, another team of scientists was preparing an assessment of the scientific basis for lynx conservation. They

published the *Ecology and Conservation of Lynx in the United States (Ruggiero et al.* 2000a). Their findings were integrated into the LCAS.

Chapter 8 of the LCAS identifies what research is needed, where little is known about the effects on lynx and its prey from such human-driven actions as precommercial thinning, snow compaction, highways, forest road densities, human developments, livestock grazing, etc. Several ongoing research efforts address these topics (See FEIS Appendix F). Research is underway in southern British Columbia, Montana, Wyoming, Washington, Utah, Idaho, Colorado, and Maine that could lead to further insights for lynx management.

In developing the Proposed Action the ID team reviewed and considered the LCAS, the *Ecology and Conservation of Lynx in the United States*, the 1999 BA, the 2000 BO, the Listing Decision, the Remand Notice (Appendix P), and other information currently available.

Why is not more being done than what was included in the Proposed Action? How do you know the Proposed Action will be enough?

Some people proposed prohibiting timber harvest in old-growth or mature stands, prohibiting grazing, further restricting or prohibiting all over-the-snow activities and removing roads in lynx habitat.

These suggestions were discussed in the previous section entitled *Management direction considerations.*

The LCAS recommendations were designed to conserve lynx, and were based on the best scientific information available. The primary source of this information, the *Ecology and Conservation of Lynx in the United States* (Ruggiero, et al. 2000a) was peer-reviewed scientific literature.

The LCAS recommendations were designed to retain future management options; a conservative approach, intended to avoid irrevocable commitments of resources that might ultimately prove to be crucial to lynx. The LCAS biology team determined that if the recommended measures were implemented, they would conserve lynx (LCAS, p. 7-1).

In addition, on page 58, the 1999 BO from the FWS said,

> *The direction provided by the conservation measures would assist Federal agencies in avoiding negative impacts on lynx. Based on the best scientific and commercial information currently available, we believe that Plans that incorporate the conservation measures, and projects that implement them, are generally not expected to have adverse impacts on lynx. Implementation of the measures in the LCAS across the range of lynx is expected to lead to the conservation of the species.*

The Proposed Action incorporated essentially all the recommended conservation measures in the LCAS (see Appendix A, the crosswalk between the LCAS, and the proposed action). The ID team determined the effects of Alternative B would be the same as those resulting from the LCAS. While the effects would

be slightly different for each of the action alternatives, all of the action alternatives would contribute to conserving lynx by addressing the deficiencies in existing plans, which was the basis for listing lynx as threatened.

Except for the issue about the effects of management activities on winter snowshoe hare habitat in multistoried forests, the public comments have identified no new information that suggests effects on lynx would be greater than anticipated. This information has been incorporated into the standards and guidelines in Alternative F.

Based on the ID team's review, there is no reason to consider conservation measures beyond those recommended in the LCAS because including them would not produce additional benefits for lynx. Further, most of the addition suggested measures would not meet the Purpose and Need of conserving lynx while maintaining the multiple-use objectives in existing plans.

As noted, more research is needed and is underway. If new information suggests different management direction is required to conserve and recover lynx, then plans would be reviewed. Subsequent planning, including ongoing and scheduled revisions, may address lynx needs where there is a need to respond to information on an individual administrative unit.

Why was just one proposal proposed for a four-state area?

The FS believes that whenever practical, management direction should be developed at the local level. In this case, developing direction locally was not practical because new information affecting many plans needed to be addressed consistently. Even though the proposal covers a large area, its scope was narrowly defined.

Why was the proposal limited to 18 national forests, instead of all the administrative units in the northern Rockies geographic area? Will this result in inconsistent management?

Eleven National Forests and the BLM units in the geographic area are addressing new information about lynx in separate planning processes (see Chapter 1).

The ID team has coordinated with these units to ensure the management direction for lynx is as consistent as possible across the range of lynx. Even so, it is likely planning for individual units would result in different decisions because of differing habitat conditions, historic management, the amount and kind of information available, and the ways direction would be integrated with other needs in these plans.

How does the National Lynx Survey affect this proposal?

The National Lynx Survey was a systematic national study conducted to evaluate lynx distribution in the listing area. When the survey detected the presence of lynx, researchers followed up with snow-tracking surveys (Squires et al., 2004 and McKelvey et al., in press) and sometimes radio-telemetry studies. This was done to help determine whether an

individual lynx passed through the area or there were lynx living in the area.

The results of the survey increased our knowledge about the distribution of lynx and their use of habitat. The survey also identified those National Forests and other public lands that are occupied by lynx.

How does the fact that hybrid lynx were found in Minnesota affect this proposal?

In 2003, FS scientists using DNA analysis discovered the first scientific evidence of hybridization in the wild between a Canada lynx and a bobcat.

Because of these findings, the FS conducted a DNA analysis of most of the lynx hair samples collected under the National Lynx Survey to see if hybridization had occurred elsewhere. So far, no additional instances have been detected.

There is no evidence of hybridization in the planning area, so this issue does not affect the proposal and there is no need to address the single case of hybridization further.

Why are trapping and shooting not addressed in the Proposed Action?

These activities are outside the jurisdiction of the FS, which is a federal land management agency.

The states regulate trapping and shooting. Trapping for lynx is not allowed in Montana, Idaho, Wyoming, Utah, or Washington. Occasionally, lynx are incidentally captured during the trapping seasons for bobcat and wolverine, mostly in Idaho, Montana, and Wyoming.

Why is predator control not addressed in the Proposed Action?

On federal lands, the USDA Wildlife Service is responsible for predator control. Predator control activities are outside the jurisdiction of the FS. There is less predator control going on now than historically occurred. It is aimed at target species and it generally takes place outside lynx habitat, in lower elevation rangelands (LCAS, p. 4-12).

Since the ban on poisons such as 1080, predator control on federal lands likely has a low potential to affect lynx (LCAS, p. 4-12). Predator control on private lands is not as closely controlled as that on federal lands, but generally occurs outside lynx habitat.

Table 2-2. Comparing how the alternatives address the issues

Alt A	Alt B	Alt C	Alt D	Alt E	Alt F‡
Issue: Effect on over-the-snow winter recreation					
Ability to expand groomed routes					
Grooming could expand under direction in existing plans • Grooming levels were stable during the 1990s and are not likely to increase during the next 5 years due to increased costs of machinery and operations, and no increases in funding from states	Grooming could expand: • On about 3,500 miles of designated ungroomed routes • Additional grooming is limited on the Flathead, Gallatin, Targhee, and Ashley NF because most designated routes are currently groomed	Grooming could expand: • On about 3,500 miles of designated ungroomed routes • In areas of consistent snow compaction	Same as Alternative C	Same as Alternative C	Same as Alternative C
Ability to expand designated routes					
• Designated ungroomed routes could expand based on existing plan direction • For outfitter-guide permits, changes in season of use are possible, but there is little ability to expand because of permitting process	• New designated routes would not be allowed above what exists as of 2000 • For outfitter-guide permits, changes in season of use would be limited, and • Little ability to expand would be found because of permitting process	• New designated routes would be allowed in areas of consistent snow compaction • For outfitter-guide permits, changes in season of use possible in areas of consistent snow compaction, but there is little ability to expand because of permitting process	Same as Alternative C	Same as Alternative C	Same as Alternative C

Alt A	Alt B	Alt C	Alt D	Alt E	Alt F‡
Effect on over-the-snow recreation					
No change in over-the-snow winter recreation	• Present opportunities would continue to exist • In the few units where grooming cannot expand, the quality of the user experience may decrease due to more crowding and safety issues. • Outfitters could not expand winter operations into new areas	• Present opportunities would continue to exist • All units would be able to provide more groomed routes and opportunities, so user experience should not change • Outfitters could expand services into some new areas	Same as Alternative C	Same as Alternative C	Same as Alternative C

Table 2-2 Comparing how the alternatives address the issues

Alt A	Alt B	Alt C	Alt D	Alt E	Alt F‡
Issue: Effects on wildland fire risk to communities					
Limits imposed on *fuel treatments* in winter snowshoe hare habitat					
Direction in existing plans	Only limits precommercial thinning; other fuel treatment projects allowed (e.g. prescribed burning, timber harvest, slashing, etc) Precommercial thinning allowed only: • Within 200 feet of administrative sites, dwellings, or outbuildings	Limits all types of fuel treatment projects except: • Within 200 feet of structures	Limits all types of fuel treatment projects, except: • Within 200 feet of structures • When a broad scale assessment finds different historic forage levels • To maintain or improve foraging habitat in the long term • To daylight thin larch, ponderosa pine, planted rust-resistant white pine, aspen, or restore whitebark pine	No limit on fuel treatment projects identified through a collaborative process.	No limit on fuel treatment projects within the WUI, except that no more than 6% of lynx habitat on each FS unit can exceed the vegetation standards. Limits fuel treatment projects outside the WUI except: • Within 200 feet of structures • To maintain or improve foraging habitat in the long term • To daylight thin planted rust-resistant white pine, aspen, or restore whitebark pine • When new information indicates little to no effect, or beneficial long-term effect
Limits on fuel treatments *outside* winter snowshoe hare habitat					
Direction in existing plans	Standards VEG S1 through VEG S4 could limit fuel treatment in some circumstances – most projects could be designed to meet the standards			No limits on fuel treatment projects	No limits on fuel treatment projects within the WUI, except no more than 6% of lynx habitat on each FS unit can

Alt A	Alt B	Alt C	Alt D	Alt E	Alt F‡
					exceed the vegetation standards Standards VEG S1 and S2 could limit fuel treatment projects outside the WUI in some cases. Most projects could be designed to meet the standards
Total acres of the 10 year fuel treatment program *in lynx habitat* that would be *unconstrained* (standards would not apply)					
881,000 acres	> 881,000 acres	0	0	881,000 acres	284,000 acres
Acres of the 10 year fuel treatment program *in the WUI* that would be *unconstrained* (standards would not apply)					
284,000 acres	> 284,000 acres	0	0	284,000 acres	284,000 acres
Acres of the 10 year fuel treatment program *outside the WUI* that would be *unconstrained* (standards would not apply)					
597,000 acres	> 597,000 acres	0	0	597,000 acres	0
Effect on wildland fire risk					
No change	• Constrains only fuel treatments that use precommercial thinning • May limit ability to reduce fire size and intensity in some places	• Constrains fuel treatments • Likely to limit ability to reduce fire size and intensity in some places	• Constrains fuel treatments, but has less standards than Alt C • Likely to limit ability to reduce fire size and intensity in some places	• Would not constrain fuel treatment • Would not limit ability to reduce fire size and intensity	• Would not constrain fuel treatment in the WUI • Would not limit ability to reduce fire size and intensity in the WUI • Constrains fuel treatments outside the WUI • Likely to limit ability to reduce fire size and intensity in some places outside the WUI

Table 2-2 Comparing how the alternatives address the issues

Table 2-2 Comparing how the alternatives address the issues

Alt A	Alt B	Alt C	Alt D	Alt E	Alt F‡
<u>Issue: Effects on maintaining winter snowshoe hare habitat in multistoried forests</u>					
Primary activities precluded in winter snowshoe hare habitat in multistoried forests					
Direction in existing plans	Precommercial thinning, with minor exceptions	All vegetation management projects, with minor exceptions	All vegetation management projects, with some minor exceptions	All vegetation management projects, except fuel treatment projects and minor exceptions	All vegetation management projects, except fuel treatment projects in the WUI and some additional minor exceptions
Effect on winter snowshoe hare habitat in multistoried forests outside wilderness					
May be reduced by 5%	May be reduced by 2%	No reduction, forage habitat maintained	No reduction, plus some habitat improved.	May be reduced by 5%, plus some habitat improved	May be reduced by 2%, plus some habitat improved
<u>Issue: Effect on the ability to restore tree species and forest structures in decline</u>					
Ability to precommercially thin *young regenerating forests* to maintain or restore tree species in decline					
Direction in existing plans	Only when stands no longer provide foraging habitat, or: • Within 200 feet of structures	Same as Alternative B, plus: • Research and genetic tests	Same as Alternative C, plus: • Daylight thinning around planted rust resistant white pine, western larch, and ponderosa pine retaining 80% of forage habitat • Restoring whitebark pine & aspen • Thinning lodgepole pine to promote future old growth • When a broad scale assessment finds different historic forage levels	Same as Alternative C, plus: • Fuel treatments developed through a collaborative process	Same as Alternative C, plus: • Daylight thinning around planted rust resistant white pine, retaining 80% of forage habitat • Restoring whitebark pine & aspen • Based on new information which indicates little to no effect or would have long term beneficial effects

The amount of precommercial thinning that could be done in planning area by alternative (in acres) based on full funding

	Alt A		Alt B	Alt C	Alt D	Alt E	Alt F‡
Reason for precommercial thinning	Outside lynx habitat	Inside lynx habitat	Inside lynx habitat	Inside lynx habitat	Inside lynx habitat	Inside lynx habitat	Inside lynx habitat
Research	80	1,450	0	1,450	1,450	1,450	1,450
Genetic tests	320	220	0	220	220	220	220
Within 200 feet of building	4,170	2,190	2,190	2,190	2,190	2,190	2,190
Restoration *	123,080	232,620	0	0	232,210	0	63,250
Western white pine	19,610	51,090	0	0	51,090	0	51,090
Whitebark pine	250	9,110	0	0	9,110	0	9,110
Aspen	3,070	3,050	0	0	3,050	0	3,050
Ponderosa pine	48,450	11,660	0	0	11,660	0	0
Larch	45,280	123,160	0	0	123,160	0	0
Lodgepole pine	6,420	34,550	0	0	34,550	0	0
Other	53,240	158,850	0	0	0	0	0
Total thinning **	180,890	395,330	2,190	3,860	236,480	3,860	67,110

*Restoration = western white pine + whitebark pine + aspen+ ponderosa pine + larch + lodgepole pine
**Total thinning = research + genetics + within 200 feet of buildings + restoration + other

Acres shown are total thinning program requested. Based on average historic funding, only about 34% of the requested amount is actually received.

Table 2-2 Comparing how the alternatives address the issues

Table 2-2 Comparing how the alternatives address the issues

Alt A	Alt B	Alt C	Alt D	Alt E	Alt F‡
Precommercial thinning deferred during next decade, based on full funding					
No deferral	393,140 acres	391,470 acres	158,850 acres	391,470 acres	328,220 acres
Precommercial thinning deferred during next decade, based on historic average funding of about 34% of what is requested					
No deferral	131,580 acres	131,060 acres	55,110 acres	131,060 acres	110,650 acres
Effect on tree species in decline					
• Opportunities for research & tree improvement • Contributes to improving conditions for whitebark pine & aspen • Contributes to improving conditions for western white pine, western larch, ponderosa pine & old growth lodgepole	• No opportunities for research & tree improvement • Contributes to continued decline of western white pine, whitebark pine, aspen, western larch & ponderosa pine • Contributes to decrease in old growth lodgepole pine	Same as Alternative B, only • Opportunities for research & tree improvement	• Opportunities for research & tree improvement • Contributes to improving conditions for whitebark pine & aspen • Contributes to improving conditions for western white pine, western larch, ponderosa pine & old growth lodgepole	Same as Alternative C, except • May contribute to improving conditions for whitebark pine and aspen if they are treated to restore fire-adapted ecosystems	• Opportunities for research and tree improvement • Contributes to improving conditions for whitebark pine, western white pine, and aspen • May contribute to decline in ponderosa pine, western larch, and old growth lodgepole pine

Alt A	Alt B	Alt C	Alt D	Alt E	Alt F‡
Issue: What level of management direction should be applied to activities that the FWS remand notice found were not a threat to lynx populations?					
Nature of management direction applied to grazing, minerals, roads, and over-the-snow recreation					
None	**Grazing** Objective GRAZ O1 Standards GRAZ S1 to GRAZ S4 Standard LINK S2	Same as Alternative B	Same as Alternative B	Objective GRAZ O1 Guidelines GRAZ G1 to G4 Guideline LINK G2	Same Objective and Guidelines as Alternative E; Guideline GRAZ G2 has slightly different wording
None	**Minerals** Objective HU O5 Standard HU S3 Guidelines HU G4 and HU G5	Same as Alternative B	Same as Alternative B	Objective HU O5 Guidelines HU G4, HU G5, and HU G12	Same Objective and Guidelines as Alternative E; Objective HU 05 has slightly different wording
None	**Roads** Guidelines HU G6 to HU G9	Same as Alternative B	Same as Alternative B	Same as Alternative B	Same as Alternative B
None	**Over-the-snow recreation** Objective HU O1 Standards HU S1 and HU S3	Same as Alternative B	Same as Alternative B	Objective HU O1 Guidelines HU G11 and HU G12	Same Objective and Guidelines as Alternative E; Guideline HU G11 has slightly different wording

‡Alternative F as described in this table represents the effects of Alternative F Scenario 1. Under Scenario 1 the management direction would apply to all lynx habitat (occupied and unoccupied) in LAUs and linkage areas. Under **Alternative F Scenario 2** the management direction **would apply only to all *occupied* habitat**. Occupied forests are the Flathead, Kootenai, Lolo, Helena, Idaho Panhandle, Targhee, Custer, Gallatin, Bridger-Teton, Shoshone, Lewis & Clark, and Clearwater National Forests. On these Forests the effects under Alternative F Scenario 2 would be the same as under Alternative F Scenario 1.

Under **Alternative F Scenario 2** the management direction **would NOT apply to *unoccupied* habitat**. For those units that are unoccupied the effects listed in the Alternative A column would reflect the effects on these units under Alternative F Scenario 2 until they become occupied, if ever. The units that are unoccupied are the Nez Perce, Salmon-Challis, Beaverhead-Deerlodge, Bitterroot, Ashley, Bighorn, and certain isolated mountain ranges of the Custer, Gallatin, Helena and Lewis & Clark National Forests. However, these units, at their option, may consider the management direction in Alternative F, so the actual effects for these units would likely be somewhere between what is indicated for Alternative A and Alternative F.

Table 2-2 Comparing how the alternatives address the issues

Table 2-3. Comparing how management concerns are addressed in the alternatives

Alt A	Alt B	Alt C	Alt D	Alt E	Alt F
Management concern: *Size of area* to which Standard VEG S1 is applied. Note: Standard VEG S1 limits to 30% the amount of an area that can be in the stand initiation structural stage (that is, too short to provide winter snowshoe hare habitat).					
Does not apply	Applies to an LAU, about 16,000 to 25,000 acres – this size makes it difficult to consider natural disturbance processes because they often involve larger areas	Applies to multiple contiguous LAUs – more closely resembles the scale of many natural disturbances	Applies to sub-basin or isolated mountain range, about 500,000 to one million acres – this size about the scale of many natural disturbances	Same as Alternative C	Same as Alternative B
Management concern: Standards that focus on particular methods, such as timber harvest and salvage logging					
Not applicable	Standards VEG S2, VEG S4, VEG S5 & VEG S6	Standard VEG S4	None of the standards	Standard VEG S5	Standards VEG S2 and VEG S5
Management concern: Guidelines that focus on methods such as timber harvest and salvage logging					
Not applicable	None	Guideline VEG G6	Guideline VEG G7	Same as Alternative D	None
Management concern: How denning habitat is considered					
Not applicable	If less than 10% denning habitat, then • Defer projects in potential denning habitat	Same as Alternative B	If less than 10% denning habitat, then • Defer projects in potential denning habitat, or • Leave enough standing trees and coarse woody debris to provide den sites	Same as Alternative D, only • Fuel treatments are not required to meet the 10% denning standard	Denning habitat should be distributed in each LAU. In cases where denning habitat appears to be lacking, project should retain course woody debris piles

Alt A	Alt B	Alt C	Alt D	Alt E	Alt F
Management concern: How adaptive management is incorporated into the Standards					
Not applicable	The 30% in the stand initiation structural stage in Standard VEG S1 could be changed based on a broad scale assessment	Same as Alternative B	Same as Alt. B, plus • Standards VEG S5 and VEG S6 would allow precommercial thinning if a broad scale assessment finds different historic forage levels • Standard ALL S2 would allow projects to proceed if they have no adverse effects on lynx	Same as Alternative B, plus • Standard ALL S2 would allow projects to proceed if they have no adverse effects on lynx, or projects that may adversely affect lynx in the short term but have beneficial effects in the long term	Same as Alternative B, plus • Project-specific changes in VEG S5 may be based on new, peer reviewed information and acceptance by regional levels of FS, and state level of FWS
Management concern: Size of area for Standard HU S1 over-the-snow routes					
Not applicable	LAU; this size makes it difficult to consider entire routes because they often involve larger areas	By LAU, or a combination of immediately adjacent LAUs	Same as Alternative C	By LAU, or a combination of immediately adjacent LAUs. Standard HU S1 changed to Guideline HU G11	Same as Alternative E
Management concern: How lynx diurnal security habitat is considered					
Not applicable	Standard HU S2: When developing or expanding ski areas, locate trails, access roads, and lift termini, to maintain and provide lynx security habitat if it has been identified as a need	Guideline HU G10: When developing or expanding ski areas and trails, access roads and lift termini should be located to maintain and provide lynx diurnal security habitat if it has been identified as a need	Same as Alternative C	Same as Alternative C	Guideline HU G10: When developing or expanding ski areas and trails, consider locating access roads and lift termini to maintain and provide lynx security habitat if it has been identified as a need.
Management concern: How upgrading roads is considered					
Not applicable	Guideline HU G6: avoid upgrading or paving roads	Guideline to HU G6: avoid or reduce effects on lynx when upgrading or paving roads	Same as Alternative C	Same as Alternative C	Same as Alternative C

Table 2-3 Comparing how management concerns are addressed in the alternatives

Table 2-4. Comparing how the LCAS risk factors are addressed in the alternatives

Alt A	Alt B	Alt C	Alt D	Alt E	Alt F
LCAS risk factor: Amount of lynx habitat in stand initiation structural stage that is too short to provide foraging habitat					
Most FS plans contain limited or no direction	Standard VEG S1, S2 Guideline VEG G1 • Standard VEG S1 limits the amount to 30% per LAU unless a broad scale assessment finds different historic levels • Standard VEG S2 limits how much can be created by timber harvest to 15% of an LAU over a 10-year period • Guideline VEG G1 encourages creating foraging habitat where it is lacking	Standard VEG S1 Guideline VEG G1, S6 • Standard VEG S1 limits the amount to 30% per combination of adjacent LAUs unless a broad scale assessment finds different historic levels • Standard VEG S2 changes to Guideline VEG G6 • Changes Guideline VEG G1 to identify forest conditions to target for creating forage habitat	Standard VEG S1 Guideline VEG G1 • Standard VEG S1 limits the amount to 30% per sub-basin or isolated mountain range unless a broad scale assessment finds different historic levels • Drops Standard VEG S2, so no restrictions on how much unsuitable habitat can be created by timber harvest • Guideline VEG G1 same as Alternative C	Standard VEG S1 Guideline VEG G1 • Standard VEG S1 limits the amount to 30% per combination of adjacent LAUs unless a broad scale assessment finds different historic levels, but would not apply to fuel treatment projects • Standard VEG S2 dropped, same as Alternative D • Guideline VEG G1 same as Alternative C	Standard VEG S1, S2 Guideline VEG G1 Same as Alternative B, except Standards VEG S1 and S2 would not apply to fuel treatments within the WUI. • Fuel treatment projects cannot exceed the vegetation standards on more than 6% of lynx habitat within an administrative unit • Guideline VEG G1 encourages creating foraging habitat where it is lacking (The guideline has slightly different wording from Alter-native C)

Alt A	Alt B	Alt C	Alt D	Alt E	Alt F
LCAS risk factor: Denning habitat					
• Most plans contain some direction for keeping dead & down material • Management direction inadequate or lacking in three FS plans	Standard VEG S3, S4 Guideline VEG G2, G3 • Standard VEG S3 requires retaining 10% denning habitat; if less, projects in potential denning habitat deferred • Standard VEG S4 prohibits salvage after a disturbance kills trees in patches smaller than five acres; unless there is 10% denning habitat, with some exceptions • Guideline VEG G2 encourages creating denning habitat where it is lacking • Guideline VEG G3 says to restore or retain denning habitat where it is less likely to burn by wildfire	Standard VEG S3, S4 Guideline VEG G2, G3 Same as Alternative B, plus • Standard VEG S4 allows salvage logging within 200 feet of structures, dwellings, or outbuildings	Standard VEG S3 Guideline VEG G3, G7 Standard VEG S3 same as Alternative B, only • Allows projects to move towards 10% denning habitat by leaving standing trees & coarse woody debris • Standard VEG S4 changed to Guideline VEG G7, so consider no salvage harvest in patches smaller than five acres if less than 10% denning per LAU • Guideline VEG G2 incorporated into VEG S3 • Guideline VEG G3 same as Alternative B	Standard VEG S3 Guideline VEG G3, G7 Same as Alternative D, only • Standard VEG S3 does not apply to fuel treatment	Guideline VEG G11 All standards and guidelines on denning combined into Guideline VEG G11, which states, "Denning habitat should be distributed in each LAU in the form of packets of large amounts of large woody debris…If denning appears to be lacking in the LAU, then projects should be designed to retain some coarse woody debris, piles, or residual trees…"

Table 2-4 Comparing how the LCAS risk factors are addressed in the alternatives

Table 2-4 Comparing how the LCAS risk factors are addressed in the alternatives

Alt A	Alt B	Alt C	Alt D	Alt E	Alt F
LCAS risk factor: Lynx foraging habitat (winter snowshoe hare habitat)					
In young regenerating forests					
Most FS plans contain limited or no direction that restrict activities in young regenerating forests. Precommercial thinning (PCT) and whitebark pine restoration (thinning followed by burning) could reduce about 24% of high density winter snowshoe hare habitat in young forests if fully funded	Standard VEG S5 Would restrict PCT, with one minor allowance. PCT could reduce less than 1% of high density winter snowshoe hare habitat in young forests	Standard VEG S5 Would restrict PCT, with a couple of minor exceptions. PCT could reduce less than 1% of high density winter snowshoe hare habitat in young forests	Standard VEG S5 Would restrict some PCT, but PCT would be allowed to restore tree species and structures in decline. PCT could reduce about 15% of high density winter snowshoe hare habitat in young forests	Standard VEG S5 Same as Alt C, except would allow fuel treatments that use PCT as a tool in young forests	Standard VEG S5 Would restrict some PCT, but PCT would be allowed to restore some tree species and structures in decline. PCT could reduce about 8% of high density winter snowshoe hare habitat in young forests if fully funded
In multistoried forests					
Most FS plans contain limited or no direction that restrict activities in multistoried forests – except old growth direction. Fuel treatments could reduce about 8% of winter snowshoe hare habitat in multistoried forests	Standard VEG S6 • Would restrict PCT, with one minor allowance. Would allow other vegetation management projects within multistoried forests. • Fuel treatments could reduce about 4% of winter snowshoe hare habitat in multistoried forests	Standard VEG S6 • Would restrict all vegetation management, with a couple of minor exceptions. • Fuel treatments could reduce less than 1% of winter snowshoe hare habitat in multistoried forests	Standard VEG S6 • Would restrict all vegetation management, with some exceptions. • Fuel treatments could reduce less than 1% of winter snowshoe hare habitat in multistoried forests	Guideline VEG G8 • Does not restrict vegetation management – but instead instructs projects to provide habitat over time. • Would not apply to fuel treatments • Fuel treatments could reduce less than 8% of winter snowshoe hare habitat in multistoried forests	Standard VEG S6 • Would restrict all vegetation management, with a couple of minor exceptions. • Would not apply to fuel treatments in the WUI • Fuel treatments could reduce less than 3% of winter snowshoe hare habitat in multistoried forests

Alt A	Alt B	Alt C	Alt D	Alt E	Alt F
LCAS risk factor: Wildland fire management					
Most FS plans contain limited or no direction	<u>Objective VEG O3</u> <u>Guideline VEG G4</u> • Objective VEG O3 says to conduct fire use activities to restore ecological processes & maintain or improve lynx habitat • Guideline VEG G4 says fire use activities should not create permanent travel routes that facilitate snow compaction. Constructing permanent firebreaks on ridges or saddles should be avoided. • The VEG objectives, standards, and guidelines would not require suppressing fires nor apply to wildland fire use	<u>Objective VEG O3</u> <u>Guideline VEG G4</u> Same as Alternative B	<u>Objective VEG O3</u> <u>Guideline VEG G4</u> Same as Alternative B	<u>Objective VEG O3</u> <u>Guideline VEG G4</u> Same as Alternative B	<u>Objective VEG O3</u> <u>Guideline VEG G4</u> • Objective VEG O3 same as Alternative B. • Guideline VEG G4 says prescribed fire activities should not create permanent travel routes that facilitate snow compaction. Constructing permanent firebreaks on ridges or saddles should be avoided • The VEG objectives, standards, and guidelines would not require suppressing fires nor apply to wildland fire use
LCAS risk factor: Winter recreation					
Most FS plans contain limited or no direction	<u>Standard HU S1, S2, S3, ALL S1</u> <u>Guidelines HU G1, G2, G3</u> • Standard HU S1 says no net-increase allowed in designated over-the-snow routes	<u>Standard HU S1, S3, ALL S1</u> <u>Guidelines HU G1, G2, G3, G10</u> Same as Alternative B, however • Standard HU S1 says no net-increase in	<u>Standard HU S1, S3, ALL S1</u> <u>Guidelines HU G1, G2, G3, G10</u> Same as Alternative C	<u>Standard ALL S1</u> <u>Guidelines HU G1, G2, G3, G10, G11, G12</u> Similar to Alternative C • Standard HU S1 changed to Guideline	<u>Standard ALL S1</u> <u>Guidelines HU G1, G2, G3, G10, G11, G12</u> • Standards HU S1, S2, and S3 changed to Guideline HU G11, G10, and G12, respectively.

Table 2-4 Comparing how the LCAS risk factors are addressed in the alternatives

Table 2-4 Comparing how the LCAS risk factors are addressed in the alternatives

Alt A	Alt B	Alt C	Alt D	Alt E	Alt F
	per LAU unless consolidating use or improving lynx habitat • Standard HU S2 says when developing or expanding ski areas, locate routes & access roads to maintain & provide lynx security habitat • Standard HU S3 restricts over-the-snow access for non-recreation special uses, timber sales, etc., to designated routes • Includes Guidelines HU G1, HU G2, and HU G3 that require considering lynx habitat and movement needs • Standard ALL S1 says new or expanded developments must maintain habitat connectivity	designated over-the-snow routes allowed per combination of adjacent LAUs, unless consolidating use, improving lynx habitat, or in areas of consistent snow compaction • Standard HU S2 changed to Guideline HU G10, which says access roads and lift termini should be located to maintain and provide diurnal lynx security habitat • Guidelines HU G1, G2, and G3 same as Alternative B		HU G11, which says use should not expand • Standard HU S2 changed to Guideline HU G10, which says access roads and lift termini should be located to maintain and provide lynx diurnal security. • Standard HU S3 changed to Guideline HU G12, which say winter access should be limited to designated routes and designated over-the-snow routes • Guidelines HU G1, G2, and G3 same as Alternative B	• Standard ALL S1 is worded slightly differently from Alternative B, to be specific to LAUs and linkage areas. • Guidelines HU G1, G2, and G3 same as Alternative B. • Guideline HU G10 is worded slightly differently to say access roads and lift termini should be located to maintain and provide lynx security habitat • Guideline HU G11 is worded slightly differently from Alternative E to include a combination of immediately adjacent LAUs. • Guideline HU G12 same as E.

Alt A	Alt B	Alt C	Alt D	Alt E	Alt F
LCAS risk factor: Highways					
Most FS plans contain limited or no direction	Standards ALL S1 and LINK S1 Guideline ALL G1 • Standard ALL S1 says new or expanded developments must maintain habitat connectivity • Standard LINK S1 says within linkage areas, potential highway crossings must be identified when construction or reconstruction is proposed • Guideline ALL G1 encourages avoiding or reducing effects on lynx when constructing or reconstructing highways and forest highways	Standards ALL S1and LINK S1 Guideline ALL G1 Same as Alternative B	Standards ALL S1and LINK S1 Guideline ALL G1 Same as Alternative B	Standards ALL S1 and LINK S1 Guideline ALL G1 Same as Alternative B	Standards ALL S1 and LINK S1 Guideline ALL G1 Same as Alternative B

Table 2-4 Comparing how the LCAS risk factors are addressed in the alternatives

Table 2-4 Comparing how the LCAS risk factors are addressed in the alternatives

Alt A	Alt B	Alt C	Alt D	Alt E	Alt F
LCAS risk factor: Forest & backcountry roads					
Some FS plans contain direction which may conserve lynx, but others contain little or no direction	<u>Guidelines HU G6, G7, G8, G9</u> ♦ Guideline HU G6 discourages upgrading & paving roads in lynx habitat where increases in human activity would result ♦ Guideline HU G7 discourages building permanent roads on ridge-tops & saddles ♦ Guideline HU G8 discourages cutting brush along low-speed, low-traffic roads ♦ Guideline HU G9 encourages restricting public motorized use on new roads built to access projects & decommissioning new roads not needed for other reasons	<u>Guidelines HU G6, G7, G8, G9</u> Same as Alternative B, only ♦ Guideline HU G6 encourages avoiding or reducing effects on lynx when upgrading & paving roads in lynx habitat where increases in human activity would result	<u>Guidelines HU G6, G7, G8, G9</u> Same as Alternative C	<u>Guidelines HU G6, G7, G8, G9</u> Same as Alternative C	<u>Guidelines HU G6, G7, G8, G9</u> Same as Alternative C

Alt A	Alt B	Alt C	Alt D	Alt E	Alt F
LCAS risk factor: Livestock grazing					
Some existing direction (INFISH, PACFISH) partially meets lynx conservation needs in most plans	Standards GRAZ S1, S2, S3, S4, LINK S2 • Standard GRAZ S1 says grazing shall be managed to allow shrubs & trees to regenerate in fire- & harvest-created openings • Standard GRAZ S2 says grazing shall be managed to ensure aspen propagation • Standards GRAZ S3, GRAZ S4, and LINK S2 says grazing shall be managed to achieve seral stage distribution similar to historic patterns in wet areas, willows, and shrub-steppe habitats	Standards GRAZ S1, S2, S3, S4, LINK S2 Same as Alternative B	Standards GRAZ S1, S2, S3, S4, LINK S2 Same as Alternative B	Guidelines GRAZ G1, G2, G3, G4, LINK G2 Changes Standards GRAZ S1, S2, S3, S4 and LINK S2 to Guidelines GRAZ G1, G2, G3, G4 and LINK G2. Changing the requirements from the imperative "shall" to "should"	Guidelines GRAZ G1, G2, G3, G4, LINK G2 Same as Alternative E. Guideline GRAZ G2 wording changed so the guideline more explicitly contributes to the long-term health and sustainability *of aspen*

Table 2-4 Comparing how the LCAS risk factors are addressed in the alternatives

Table 2-4 Comparing how the LCAS risk factors are addressed in the alternatives

Alt A	Alt B	Alt C	Alt D	Alt E	Alt F
LCAS risk factor: Oil & gas leasing					
Most FS plans contain limited or no direction	<u>Standard HU S3</u> <u>Guidelines HU G4, G5</u> • Standard HU S3 says motorized over-the-snow access for mineral & energy exploration & facilities shall be restricted to designated routes • Guideline HU G4 encourages remote monitoring • Guideline HU G5 encourages developing reclamation plans that improves lynx habitat	<u>Standard HU S3</u> <u>Guidelines HU G4, G5</u> Same as Alternative B	<u>Standard HU S3</u> <u>Guidelines HU G4, G5</u> Same as Alternative B	<u>Guidelines HU G4, G5, G12</u> Similar to Alternative B, only • Changes Standard HU S3 to Guideline HU G12, changing the requirement from the imperative "shall" to "should"	<u>Guidelines HU G4, G5, G12</u> Same as Alternative E
LCAS risk factor: Land ownership patterns					
Most FS plans contain limited or no direction	<u>Guideline LINK G1</u> • Guideline LINK G1 encourages retaining NFS lands in public ownership	<u>Guideline LINK G1</u> Same as Alternative B	<u>Guideline LINK G1</u> Same as Alternative B	<u>Guideline LINK G1</u> Same as Alternative B	<u>Guideline LINK G1</u> Same as Alternative B

Table 2-5. Comparing how the alternatives affect lynx

Alt A	Alt B	Alt C	Alt D	Alt E	Alt F
Effects on lynx: Effects of proposal (change in effects from Alternative A)					
To Individuals No change; adverse effects continue. ***To Populations*** No change; adverse effects continue	*To Individuals* Substantial beneficial effects, with some adverse affects possible because there is no management direction for multistoried forests, beyond limiting precommercial thinning. All other risk factors have been addressed. ***To Populations*** Substantial beneficial effects, with some adverse affects possible because there is no management direction for multistoried forests, beyond limiting precommercial thinning. All other risk factors have been addressed.	***To Individuals*** Beneficial effects; all risk factors substantially addressed. ***To Populations*** Long-term beneficial effects; all risk factors substantially addressed.	***To Individuals*** Some beneficial effects; some risk factors related to vegetation are only partially addressed. ***To Populations*** Some beneficial effects; some risk factors related to thinning are only partially addressed.	***To Individuals*** Some beneficial effects; some risk factors related to vegetation management and fuels treatment are only partially addressed. ***To Populations*** Some beneficial effects. Allowance for fuel treatment projects may result in adverse affects across an administrative unit	***To Individuals*** Some beneficial effects; some risk factors related to vegetation management and fuels treatment only partially addressed. ***To Populations*** Some beneficial effects; Allowance for fuel treatment projects in the WUI may result in adverse affects on 6% of lynx habitat within an administrative unit
Effects on lynx: Effects of plans as amended					
To Individuals No change: adverse effects continue. ***To Populations***	***To Individuals*** Substantial beneficial effects, with some adverse affects possible because there is no management direction for multistoried forests, beyond limiting precommercial thinning. All other risk factors have been	***To Individuals*** Beneficial effects; all risk factors substantially addressed. ***To Populations*** Beneficial effects; all risk	***To Individuals*** Some beneficial effects; may be some adverse effects over the short term; some risk factors related precommercial thinning only partially addressed. ***To Populations***	***To Individuals*** Some beneficial effects; may be some adverse effects over the short or long term. Allowing fuel treatment projects may result in adverse effects. ***To Populations*** Some beneficial effects; may be some adverse effects over the	***To Individuals*** Some beneficial effects; may be some adverse effects over the short or long term; some risk factors. Allowing fuel treatment projects in the WUI may result in adverse effects on 6% of lynx habitat in an administrative

Table 2-5 Comparing how the alternatives affect lynx

Table 2-5 Comparing how the alternatives affect lynx

Alt A	Alt B	Alt C	Alt D	Alt E	Alt F
No change; adverse effects continue.	addressed. ***To Populations*** Substantial beneficial effects, with some adverse affects possible because there is no management direction for multistoried forests, beyond limiting precommercial thinning. All other risk factors have been addressed.	factors substantially addressed.	Some beneficial effects; may be some adverse effects over the short term; some risk factors related to precommercial thinning only partially addressed.	short or long term. Allowing fuel treatment projects may result in adverse effects.	unit. ***To Populations*** Some beneficial effects; may be some adverse effects over the short term. Allowing fuel treatment projects in the WUI are not likely to result in adverse effects on populations because 94% of lynx habitat would have adequate protections
Effects on lynx: Contributes to conserving species					
No	Substantially contributes to conservation of lynx; however there is no management direction beyond precommercial thinning for multistoried forests	Yes	Partially Many standards contribute to conserving lynx but thinning allowances may result in adverse effects	Partially Many standards contribute to conserving lynx but vegetation standards that allow fuel treatment may result in adverse effects	Yes, because risk factors have been substantially addressed and there are limits on fuel treatment projects in lynx habitat.

Table 2-6. Comparing how the alternatives affect other resources

Alt A	Alt B	Alt C	Alt D	Alt E	Alt F
Effects on threatened, endangered, and proposed animal species other than lynx					
The No Action Alternative would not add any new management direction. There would be no change in effects from those described in existing Forest Plans.	All alternatives result in *both limited reduction and improvement* in habitat and are not likely to adversely affect listed or proposed species. Species include: mammals including grey wolf and grizzly bear; fish including bull trout, Chinook salmon, steelhead trout, and sockeye salmon.				
Effects on sensitive animal species					
The No Action Alternative would not add any new management direction. There would be no change in effects from those described in existing Forest Plans.	All alternatives result in *limited improvement* in habitat for mammals including wolverine; birds including black-backed woodpecker, red-naped sapsucker, three-toed woodpecker, Williamson's sapsucker, and white-headed woodpecker; and amphibians including boreal toad and northern leopard frog. All alternatives result in *both limited reduction and improvement* in habitat and are not likely to adversely affect any sensitive species. Species include: mammals including fisher and marten; birds including boreal owl, great grey owl, northern goshawk, olive-sided flycatcher, and Swainson's thrush; fish including artic grayling, Bonneville cutthroat trout, burbot, Colorado River cutthroat trout, interior redband trout, mountain sucker, Pacific lamprey, Snake River cutthroat trout, Snake River spring/summer Chinook, westslope cutthroat trout, and Yellowstone cutthroat trout. All alternatives may cause *limited reduction* in habitat for one bird species, the Hammond's flycatcher. The alternatives are not likely to adversely affect these species.				
Effects on management indicator species					
The No Action Alternative would not add any new management direction. There would be no change in effects from those described in existing Forest Plans.	All alternatives result in *limited improvement* in habitat for mammals including beaver and moose; birds including blue grouse, downy woodpecker, hairy woodpecker, mountain bluebird, northern flicker, red-breasted nuthatch, ruby-crowned kinglet, willow flycatcher, yellow bellied sapsucker, and yellow warbler. All alternatives result in *both limited reduction and improvement* in habitat and are not likely to adversely affect any species. Species include: mammals including black bear, bobcat, elk, mule deer, red squirrel, and white-tailed deer; birds including pileated woodpecker; fish including brook trout, cutthroat trout, rainbow trout, trout; and macro-invertebrates				
Effects on fish & aquatics					
The No Action Alternative would not add any new management direction. There would be no change in effects	Negligible effects.				

Table 2-6 Comparing how the alternatives affect other resources

Alt A	Alt B	Alt C	Alt D	Alt E	Alt F
from those described in existing Forest Plans.					
Effects on plants – threatened, endangered, proposed, and sensitive species					
The No Action Alternative would not add any new management direction. There would be no change in effects from those described in existing Forest Plans.	Beneficial or no effect to all species.				
Effects on timber management					
The No Action Alternative would not add any new management direction. There would be no change in effects from those described in existing Forest Plans.	May reduce opportunities for regeneration harvest where there are large areas of very young regenerating forests. Approximately 13% of the LAUs exceed the 15% timber and 30% disturbance standards Could increase opportunities for regeneration harvest where foraging habitat is lacking Some projects may have to be deferred or locations changed where denning habitat is lacking; but denning habitat generally is not lacking	Same as Alternative B, except that in Alternative C: It is less likely that the amount of habitat in very young forest condition would constrain regeneration harvest; and Timber harvest in multistoried foraging habitat could be deferred or modified to avoid reducing habitat	Same as Alternative C, except that in Alternative D: Some timber harvest could take place in multistoried foraging habitat, especially when it can be designed to maintain and improve forage conditions	Same as Alternative D, except that in Alternative E: Only timber harvest for fuel treatment would be unaffected by any of the vegetation standards	Same as Alternative B, except that in Alternative F: Some timber harvest may be unaffected if done for fuel treatment purposes within the WIU, as defined by HFRA. Timber harvest could occur in multistory forest when designed to maintain and improve forage conditions, or in areas where forage is lacking. Denning habitat would not constrain timber harvest.
Effects on range					
The No Action Alternative would not add	Limited effects: In some cases, livestock management may need to be intensified or structural			Same as Alternative B, except that Alternatives E and F:	

Alt A	Alt B	Alt C	Alt D	Alt E	Alt F
any new management direction. Current livestock grazing practices would not change on federal grazing allotments. There would be no change in effects from those described in existing Forest Plans.	improvements added in the allotment. Most likely to affect grazing on units east of the Continental Divide that currently are without aquatic direction in existing plans.			May have fewer effects on livestock grazing practices because standards are changed to guidelines.	
Effects on developed winter recreation					
The No Action Alternative would not add any new management direction. **Ski areas** and **outfitter-guide operations** on NFS lands would be managed as they have been under the existing plans. **Winter trails:** designation and grooming are not constrained beyond what is currently described in each Plan, but they are likely to remain at current levels for at least the next five years due to funding. There would be no change in effects to winter recreation from those described in existing Forest Plans.	**Ski areas:** No change to existing ski areas. Would not preclude further development, however, new ski areas and expansions would have to incorporate design measures to provide for lynx habitat needs. Could affect timing of operations, where ski runs are located, and the costs associated with development. **Outfitter-guide:** would be limited to existing designated over-the-snow routes and areas. **Winter trails:** The level of designated routes would be maintained at about	**Ski areas:** Same as Alternative B, only Alternatives C and D are less likely to affect timing of ski area operations. **Outfitter-guide:** Could expand into areas of consistent snow compaction that are not currently designated or groomed. **Winter trails:** Would allow increases in designated over-the-snow routes if the increases consolidate use and improve lynx habitat. Grooming could expand on 3,500 miles of designated, ungroomed routes in lynx habitat.		**Ski areas:** Same as Alternatives C and D. **Outfitter-guide:** Same as Alternatives C and D. **Winter trails:** Could result in an increase in designated over-the-snow routes, but should not result in more compacted snow since expansion would be into areas already compacted as established in the baseline. Grooming could expand on 3,500 miles of designated, ungroomed routes in lynx habitat.	

Table 2-6 Comparing how the alternatives affect other resources

Table 2-6 Comparing how the alternatives affect other resources

Alt A	Alt B	Alt C	Alt D	Alt E	Alt F
	8,000 miles. Grooming could expand on approximately 3,500 miles of designated ungroomed routes in lynx habitat.				
Effects on minerals					
Management direction concerning **mineral materials, locatable minerals, leasable minerals, or development of outstanding or reserved rights** would not be changed under the No Action Alternative, so there would be no change in effects from those described in existing Forest Plans.	**Mineral Materials:** There would be minimal effects on new sites, or expansion or further development of existing sites since most are near existing roads. **Locatable minerals:** Operations can not be precluded, but lynx habitat needs to be considered and lynx habitat connectivity to be provided. This could require additional mitigation to minimize effects on lynx, and could increase costs of development. **Leasable minerals:** These alternatives would not affect availability nor preclude operations. However, there is potential of increased costs for mineral exploration and development due to mitigation measures such as remote monitoring, shifting proposed winter operations to other seasons, or the use of off-site mitigation or off-site production facilities. **Outstanding minerals or reserved rights:** Operations can not be precluded, but reasonable mitigation measures may be used to protect habitat for lynx.			**Mineral Materials:** Some standards changed to guidelines, but effects would be the same as Alternative B. **Locatable minerals:** May have lower cost increases than Alternatives B, C, and D because some standards are changed to guidelines. **Leasable minerals:** May have lower cost increases than Alternatives B, C, and D because some standards are changed to guidelines. **Outstanding minerals or reserved rights**: May have lower cost increases than Alternatives B, C, and D because some standards are changed to guidelines. Operations can not be precluded, but reasonable mitigation measures may be used to protect habitat for lynx.	
Effects on highways					
Incorporating wildlife crossings into highway design is already being done by state and federal agencies. The No Action Alternative would not add any new management direction. There would be no change in effects from those described in existing Forest Plans.	Little effect is anticipated. Incorporating wildlife crossings into highway design, is already being done by state and federal agencies.				

Alt A	Alt B	Alt C	Alt D	Alt E	Alt F
Effects on forest roads					
The No Action Alternative would not add any new management direction. There would be no change in effects from those described in existing Forest Plans	No restrictions on existing roads. Public motorized use of newly built roads in lynx habitat may be restricted Upgrades to existing roads that result in increased traffic speeds or volumes are discouraged	Same as Alternative B, except: Where upgrades to existing roads result in increased traffic speeds or volumes, they may be allowed if designed to reduce effects on lynx.			
Effects on changing land ownership					
The real estate program would not change. Land ownership adjustments would continue, but may not be a priority because of limited funding. The No Action Alternative would not add any new management direction. There would be no change in effects from those described in existing Forest Plans	Limited effect on land exchanges. Discourages disposing of lynx habitat by exchanging it away. Lynx habitat could be acquired.				
Effects on land uses					
The No Action Alternative would not add any new management direction to maintain lynx habitat connectivity in linkage areas. There	Projects would need to maintain lynx habitat connectivity.				

Table 2-6 Comparing how the alternatives affect other resources

Table 2-6 Comparing how the alternatives affect other resources

Alt A	Alt B	Alt C	Alt D	Alt E	Alt F
would be no change in effects from those described in existing Forest Plans					
Economic effects from limiting precommercial thinning					
Based on historic average funding, under the No Action Alternative about 200,000 acres would be thinned, representing about 180 jobs per year and about $2.0 million per year in labor income. Based on full funding, about 581,000 acres would be thinned, representing about 530 jobs per year and about $5.8 million per year in labor income	Based on historic average funding, about 120 jobs per year could be reduced and labor income decreased by $1.3 million per year from Alternative A Based on full funding, about 360 jobs per year could be reduced and labor income decreased by $4 million per year from Alternative A		Based on historic average funding, about 70 jobs per year could be reduced and labor income decreased by $800,000 per year from Alternative A Based on full funding, about 210 jobs per year could be reduced and labor income decreased by $2.3 million per year from Alternative A.	Same as Alternatives B and C.	Based on historic average funding, about 100 jobs per year could be reduced and labor income decreased by $1.1 million per year from Alternative A Based on full funding, about 300 jobs per year could be reduced and labor income decreased by $3.2 million per year from Alternative A.
Economic effects from limiting increases to groomed and designated over-the-snow routes					
An increasing trend in snowmobile use is likely. Since the No Action Alternative would impose no change to winter recreation opportunities, it would have no effect on the economic contributions of snowmobiles.	No effect to economy: Existing uses would continue Some undesignated routes may see increased use There may be some local effects because outfitters cannot expand. ‡	No effect to the economy. Would allow no net increase in designated over-the-snow routes, except where existing use already is concentrated. Grooming could expand on routes currently designated. Unlikely to result in localized effects on outfitters.			

Alt A	Alt B	Alt C	Alt D	Alt E	Alt F
Social effects					
Alternative A would not change the current social environment or employment opportunities, so there would be no social effects from the No Action Alternative.	Higher use on existing designated or groomed over-the-snow routes could occur, changing user experience ‡ Fewer employment opportunities due to decreases in precommercial thinning (see economics effects above). Higher use on existing designated or groomed over-the-snow routes could occur, changing user experience There would be negligible social effect from grazing, ski areas, and mining direction.	Over-the-snow user experience should not change as a result of Alternative C Fewer employment opportunities due to decreases in precommercial thinning (see economics effects above). There would be negligible social effect from grazing, ski areas, and mining direction.	Social effects same as Alternative C with somewhat different employment opportunities, depending on alternative (see economics effects from limiting precommercial thinning, above).		
Effects on environmental justice					
The No Action Alternative would not add any new management direction. There would be no change in effects from those described in existing Forest Plans.	No differential effects to any minority or low-income population or community were found. Input from all interested persons and groups have been considered.				

‡ Grooming levels have been stable during the past five years and are not likely to increase during the next five. This is due the increased costs of machinery and grooming operations, while the funding from the states to do grooming has not increased.

Table 2-6 Comparing how the alternatives affect other resources

Chapter 3 Affected Environment & Effects

Introduction

Chapter 3 describes the potentially affected resources of the planning area and the effects of the alternatives on these resources.

Chapter organization

Chapter 3 is organized into sections by resource. The sections are:

- Lynx
- Other wildlife & fish
- Fire
- Forests
- Plants
- Range
- Recreation
- Transportation
- Minerals
- Land ownership
- Linkage habitat
- Special use permits
- Economic and social
- Other disclosures

Each section describes the affected environment for that resource and discloses the impacts of Alternative A, the no-action alternative; Alternative B, the Proposed Action; Alternatives C, D, and E, the other action alternatives in the DEIS; and Alternative F, the alternative developed from public comments on the DEIS. Alternative F is the FEIS preferred alternative.

Each resource section is supported by specialist reports and data that can be found in the Project Record.

NEPA regulations in Section 1500.5, Reducing Paperwork, says environmental documents should be short, written in plain language, analytic rather than encyclopedic, and discuss only briefly issues that are not significant. This document has been written to meet that direction while complying with all other laws, regulations, and policy.

Nature of effects

The proposal is programmatic in nature, consisting of direction that would be applied to future management activities. It does not prescribe site-specific activities on the ground, nor does it irreversibly commit resources. CEQ regulations define *direct effects* as those occurring at the same time and place as the proposal. There are no direct environmental consequences of the proposal; therefore this analysis discusses only *indirect* and *cumulative* effects of the alternatives. Direct effects would result from site-specific projects that implement this direction, and would be evaluated when those decisions are made.

In analyzing effects in this document, it is assumed the standards would be met

because complying with standards is mandatory. The analysis of effects is based primarily on projections of how future activities and areas would change because of the proposed standards. Such projections are inherently uncertain.

It is also assumed that the objectives generally would be achieved and the guidelines would generally be followed, though that may not always be true.

The baseline for effects disclosed in this chapter is the existing plans. The effects of existing plans have been previously determined and disclosed in the NEPA analyses that accompanied them. This FEIS describes changes in effects resulting from incorporating the lynx conservation measures into those plans.

Generally, effects are presented as changes from existing plans, represented by Alternative A, the no action alternative. In other cases effects on lynx are presented by comparing them to Alternative B, the Proposed Action. Cumulative effects include the effects of the existing plans as disclosed in their accompanying NEPA documents. They are incorporated into the cumulative effects analysis by reference.

Significance of effects

NEPA requires an EIS to be prepared for proposals that significantly affect the quality of the human environment. This document was prepared as an EIS based on the level of public interest, not because of the presence of significant effects from any of the alternatives.

The overall effect of the action alternatives is to reduce the likelihood of effects from future projects. This analysis has not identified any environmental effects likely to be significant. This FEIS also discloses the indirect effects of not taking future actions (Alternative A).

Lynx

Analysis process

Planning area

The planning area includes lynx habitat in the 18 NFs described in Chapter 1 (see Table 1-1). The planning area includes more than half the lynx habitat in the Northern Rocky Mountains Geographic Area.

More than 38 million acres of National Forest System (NFS) lands are inside the planning area. Of these, nearly 18,500,000 acres are lynx habitat (see Table 3-1). Almost half of the NFS lands have been mapped as lynx habitat (see Table 3-1, the *Proposed Action* section of Chapter 1, and Appendix B for a discussion of habitat mapping). About 43 percent of lynx habitat in the planning area is available for development and active management - see Appendix E for a description of management area categories.

Analysis boundary

Generally, the boundary for evaluating effects, including cumulative effects is lynx habitat in LAUs in the planning area (Figure 1-1). This boundary was chosen because for most resources, the effects of the proposal are limited to changes in direction for lynx habitat within the administrative boundaries of the units whose plans are being amended.

The analysis boundaries for economics, lynx, and effects on human communities, are different. See those sections for descriptions of their analysis boundaries.

Some effects were evaluated based on

Table 3-1. Lynx habitat in the planning area

Area	Unit of measure
Planning area acres	38,530,000 acres
Habitat acres in planning area	18,470,000 acres
Habitat percent of agency land	48%
Habitat acres in development allocations [1]	7,940,000 acres
Percent habitat in development allocations	43%
Habitat acres in non-development allocations [2]	10,530,000 acres
Percent habitat in non-development allocations	57%

[1] *Development land allocations* in existing plans allow *developments* like campgrounds and *active management* like timber sales

[2] *Non-development land allocations* are places where natural disturbance processes predominate, such as wilderness, roadless, and semi-primitive non-motorized areas

Appendix E contains a description of management area categories.

data compiled for administrative units (see Appendix K for that data). This data reflects information on the major program areas that may affect lynx. It generally includes information on the 10-year program of work by individual administrative units.

Analysis tools

Geographic inventory system (GIS) is a computerized mapping tool. GIS layers include:

- *Lynx habitat maps* – Each unit provided a map of lynx habitat based on vegetative data and snow depths – see Appendix B. Figure 1-1 is a compilation of those maps, used as a base layer for other analysis.
- *Linkage area maps* – Linkage areas were identified by an interagency group of biologists and state transportation planners, based on the criteria found in Appendix B. Figure 1-1 uses arrows to show the linkage areas. Linkage area maps were used to determine which highways might be affected by the proposal. The resulting map applies to all units in the planning area.
- *Management area maps*, which were used to evaluate how much lynx habitat is in developmental and non-developmental or wilderness allocations. These maps apply to all units in the planning area (Project file).
- *Fire perimeter maps,* which were used to evaluate how much lynx habitat in unsuitable condition exists in FS Region 1. This map applies to all units in FS Region 1 (Hillis et al. 2003).
- *2000 Census data map,* which provided population information. This map was used as a proxy for determining the wildland urban interface (WUI). The WUI was assumed to be the area within one mile of a population density of 28 people per square mile (Project file, GIS maps). This map was used to evaluate the amount of lynx habitat in the planning area in the WUI, as well as the type of lynx habitat in the WUI on the administrative units in Montana (Bush 2006, Project file Analysis FEIS FIA data). The basis for determining WUI was change between the Draft and Final EIS - see the Fire section for further discussion.

FIA (Forest inventory and analysis)
FIA is a systematic collection of vegetative data across the United States, managed by FS Research and Development. FIA data for Montana was used to find the acres of lynx habitat with an abundance of small trees (tree density as measured as trees per acre) that would be within the reach of snowshoe hares in winter – this information was used as a proxy for winter snowshoe hare habitat. In addition the data was used to determine stand structure (multi-story vs. single story). It was used to determine the amount of high- and low-density forests within and outside both wilderness and the WUI (Bush 2006).

Only Montana FIA data was used because it was the only data readily available. Montana provides a large sample of the planning area because it contains about half of the planning area's lynx habitat. Montana can serve as a surrogate for the

entire planning area, because northern Idaho is similar to western Montana, and southern Idaho, Wyoming and Utah are similar to southeastern Montana.

Typically, tools that describe habitat include some quantification of a number of variables to assess how suitable areas are as habitat. Factors known or believed to be important in providing lynx habitat include:

- Snow depth and condition (fluffy, not wet)
- Stand structure
- Vegetation type
- Density of small diameter trees that may provide snowshoe hare forage
- Availability of large down woody material for dens
- Stand size
- Juxtaposition of stands on the landscape

Other factors, such as slope and aspect, may also play a role in providing habitat for lynx. Knowledge about the quantification and relationships between these variables is limited.

The FIA analysis of winter snowshoe hare habitat is most appropriately used as an index to compare relative effects among the alternatives. It does not provide a definitive assessment of how much or of the quality of snowshoe hare habitat. Because the other variables could not be included, the FIA analysis likely overstates the amount and quality of snowshoe hare habitat.

Data by unit

Each National Forest provided data about its activities in the planning area and the acres that overlap lynx habitat. Data was provided about precommercial thinning, fuel treatment program, grazing allotments, designated and groomed routes, ski areas, special use agreements, minerals, and forest roads – see Appendix K. The data was used to evaluate the potential effects on lynx and on each resource. Data regarding oil and gas leasing was updated between the Draft and Final EIS. Additional information on fuel treatments for the planning area was collected and utilized for the FEIS.

TSMRS (Timber stand management and resource system)

TSMRS is a computer program developed and used by FS Region 1 to track vegetation management and follow-up needs such as tree planting and precommercial thinning.

Each forest is broken down into large stands, and activities are tracked by stand. Such activities include but are not limited to timber harvest, planting, slashing, prescribed burning, reforestation surveys, etc. TSMRS data was used to evaluate the amount of lynx habitat in young regenerating forests created by timber harvest (Hillis et al. 2003), and to determine the amount of precommercial thinning scheduled during the next decade.

Since TSMRS is used to track reforestation and precommercial thinning program of work the information is generally accurate; especially in regards to date and type of timber harvest.

Cumulative effects analysis

Cumulative effects are summarized at the end of each resource section and supported by the information in Appendix L, which gives a description of all past, present, and reasonably foreseeable programmatic actions in the planning area. Appendix L describes which actions are included in the cumulative effects analysis for each resource, and how or why some actions do not affect a particular resource.

Analysis information

The analysis of the effects on lynx began with a review of literature related to Canada lynx and snowshoe hare biology, ecology, and habitat relationships. New literature, published since the release of the DEIS, has been reviewed and incorporated, where appropriate. Public comments collected during scoping and on the DEIS were reviewed to see whether any additional information about lynx was supplied. Personal communications were conducted with FS and FWS biologists and with researchers investigating lynx and snowshoe hares.

Analysis boundary for lynx

The analysis evaluates the effects of the alternatives on lynx in the planning area. Cumulative effects on lynx are evaluated for the entire Northern Rockies Geographic Area, an area with unique ecosystems and management histories (LCAS).

Assumptions

1) The analysis of effects is based primarily on projections of changes in future actions because of the proposed standards and guidelines.
2) The lynx habitat maps provided by FS administrative units were used as the geographic basis for assessing effects in lynx habitat - see the discussion of mapping in the *Proposed Action* section of Chapter 1.
3) Except for fire management and snow compaction, the majority of human-related effects on wildlife are in the development land allocations, where such things as ski areas and timber sales are allowed (Hickenbottom et al. 1999). See Appendix E.
4) Most effects to species are *short-term*, defined as the ten years from 2006 to 2015. *Long-term* effects are those expected to occur sometime after a decade. This time period was used because it is anticipated the plans subject to this proposal would be revised by 2015 and information about program activities can only be projected so far into the future.
5) The direction provided in existing plans is adequate to provide habitat for species other than lynx. The LCAS provides recommendations to reduce or eliminate risks and provide for lynx habitat needs based on the most comprehensive recent information about threats and risks to conserving lynx.

Biology

Canada lynx are medium-sized forest carnivores occupying northern forests with abundant snowfall. They have long ear tufts, lightweight body frames and very large paws for their size, which act like snowshoes supporting them on top of fluffy snow.

Lynx tend to have very large home ranges, varying from about 15,000 to 30,000 acres or ten to 20 square miles. Lynx are highly mobile; long-distance movements (greater than 60 miles) are characteristic (Aubry et al. 2000; Mowat et al. 2000).

They seem to prefer to move through continuous forests, and have been observed to avoid large openings until shrubs and trees provide enough cover to hide them (Ruggiero et al. 2000a; Appendix P). They tend to be reclusive so many people who have spent a lot of time in the woods in winter have never seen a lynx.

Snowshoe hares are the primary prey of lynx, making up from 35 to 97 percent of the diet (Ruggiero et al. 1994, Apps 2000; Aubry et al. 2000; Mowat et al. 2000). Red squirrels may be an important alternate prey, especially when hare populations decline (Koehler 1990; O'Donoughue 1998). Indications are that the summer diet may include a greater variety of prey species (Mowat et al. 2000).

Lynx tend to be less successful hunters than other carnivores, like coyotes and owls, with which they compete. The main cause of lynx mortality is starvation – kittens and young adults both starve to death at high rates if prey – particularly snowshoe hares – is not abundant.

Habitat

Lynx habitat in the planning area is characterized by abundant moisture, with

Figure 3-1. Lynx photos

Lynx have light body frames

Lynx have big feet that let them walk on top of snow

deep winter snow. Habitat tends to be somewhat drier in the southern and eastern parts of the planning area.

Lynx habitat includes primarily cool, moist subalpine fir and Engelmann spruce forests, and moist lodgepole pine forests. Cool, moist forests of Douglas-fir, grand fir, western larch, and aspen contribute to lynx habitat where intermingled with or adjacent to Engelmann spruce or lodgepole pine. In extreme northern Idaho and in northwestern Montana, cedar-hemlock forests also are considered lynx habitat (Ruggiero et al. 2000a).

Lynx habitat is found generally at mid to upper elevations. Lower elevations range from about 3,500 feet in the north to 7,000 feet in the southern parts of the planning area.

Lynx use a variety of forest ages and structural stages. They use young regenerating forests and multistoried forests that provide habitat for snowshoe hares. They move through continuous forests, and frequently use ridges, saddles, and riparian areas (Koehler 1990; Staples 1995). They use forests with abundant dead and down trees for dens to raise their kittens, especially when denning sites are close to foraging habitat. In the winter, lynx do not appear to hunt in openings, where the lack of cover limits habitat for snowshoe hares.

Lynx habitat is affected by natural disturbances such as fire, and vegetation management such as timber harvest and prescribed fires.

Where lynx occur

About 60 percent of lynx habitat in the lower 48 states occurs in the northern Rockies (Appendix P); the Northern Rockies Geographic Area likely has the largest lynx population of the five geographic areas where lynx occur. This is likely due to relatively high quality lynx habitat in large blocks found in the northern Rockies. In addition, the northern Rockies are well connected throughout the geographic area and with Canada.

Lynx historically occurred in all four states of the planning area (Ruggiero et al. 2000a).

In May 2005, the FS and FWS jointly developed the definition of occupied lynx habitat (USDA FS, USDI FWS 2006a). Information from the FWS *Lynx Recovery Outline* (USDI FWS, 2005a) was considered during development of the definition of occupied habitat.

All mapped lynx habitat on an entire national forest is considered *occupied* by lynx when:

1. There are at least two verified lynx observations or records since 1999 on national forests unless they are verified to be transient individuals; or
2. There is evidence of lynx reproduction on the national forest.

Forests that meet these occupied criteria were then examined to evaluate whether portions of the forest had isolated regions, disjunct mountain ranges, or peripheral areas that did not meet the "occupied" criteria stated above. Portions of some

forests were removed from occupied status.

Once an area is considered "occupied" it remains occupied. Lynx are wide ranging and their distribution expands and contracts to some degrees in the northern United States when populations in Canada expand and contrast. Areas historically used by lynx (pre-1999) but which are currently unoccupied, are not considered "occupied" based on the definition above. At some point in the future when lynx populations increase during years of high snowshoe hare densities, these areas may become occupied by lynx.

Verified observation or records are those that scientifically document a lynx by identifying physical remains, live-captured animals, or DNA samples. Verified records may come from the National Lynx Survey, mortality records, photographs, research, or surveys. Verified records must be associated with generally reliable sources, such as formal research and survey efforts carried out by agencies, tribal governments, or universities with appropriate quality control (USDA FS, USDI FWS 2006a).

In addition, the FWS *Recovery Outline* (USDI FWS 2006a) also categorizes lynx habitat and occurrence into three categories: (1) core areas, which have the strongest long-term evidence of lynx; (2) secondary areas, which have fewer and more sporadic current and historical records of lynx; and (3) peripheral areas, which contain very few verified historical or recent records of lynx. See Chapter 1 for more discussion.

In *Idaho* lynx were never abundant but were distributed throughout northern portion of the state. The Idaho Panhandle, Clearwater, and Targhee National Forests have recent verified records of lynx occurrence and are considered occupied based on the National Lynx Survey and other documented sightings (Appendix P, USDA FS, USDI FWS 2006a).

The Idaho Panhandle and Targhee NFs contain both "core" and "secondary" habitat (see Chapter 1, pp. 4-5). The Clearwater NF contains secondary habitat.

No lynx have been verified on Nez Perce and Salmon-Challis National Forests since 1999. The Nez Perce National Forest has not been surveyed, but is being surveyed this winter (2006/2007). Based on the findings this unit would either be identified as occupied or not. The Nez Perce and Salmon-Challis are identified as secondary habitat in FWS *Recovery Outline*.

In *Montana*, numerous historic and current lynx records exist in the western part of the state. Lynx are currently known to be widely distributed throughout northwest Montana and breeding has been documented in multiple locations (USDI FWS 2005b). Historical records in southwestern Montana are fewer and more sporadic. As a result historical lynx abundance has been low and reproduction has not been documented.

All national forests in Montana, except the Bitterroot and Beaverhead-Deerlodge and disjunct mountain ranges on the Custer, Gallatin, Helena and Lewis and Clark have recent verified records of lynx

occurrence since 1999 (USDA FS, USDI FWS 2006a) and are considered occupied.

The Flathead, Kootenai and Lolo NFs are identified as core areas. The Custer, Gallatin and Helena NFs contain both core and secondary habitat. The Beaverhead-Deerlodge and Bitterroot are considered secondary habitat. The isolated mountain ranges, the Pryor Mountains on the Custer and the Highwood and Snowy Mountains on the Lewis and Clark NF are considered peripheral habitat. The Lewis and Clark NF also has areas identified as core and secondary habitat.

In *Wyoming* most historical and recent records of lynx are from the northwestern mountain ranges. A lynx study began in western Wyoming in 1996, where a radio-collared female produced four kittens in 1998. Recent snow-track surveys indicated lynx have declined and now are quite rare in northwestern Wyoming (Squires, pers. com Dec 7, 2006). The decline is likely because the habitat is naturally marginal (more patchy and drier forests) and less capable of supporting snowshoe hares and is further from source populations (Appendix P).

Lynx detection surveys conducted in Yellowstone National Park from 2001 to 2004 documented lynx presence and reproduction (Murphy et al. 2006). In addition, up to four lynx from the Colorado introduction are currently (2006) resident within the Greater Yellowstone Area. Reproduction has not been documented for these introduced individuals, but males and females now have overlapping home ranges so reproduction is likely in the future (J. Squires pers. com; Dec 7, 2006).

The Bridger-Teton and Shoshone National Forests in Wyoming have recent verified records of lynx occurrence and are considered occupied. The Bridger-Teton and Shoshone are identified as core areas. The Bighorn National Forest has no verified records of lynx occurrence since 1999 and is considered unoccupied. This unit is also identified as peripheral habitat in the FWS *Recovery Outline* because it contains few verified historical or recent records of lynx (USDI FWS, 2005a).

In *Utah* there are only 10 verified records of lynx since 1916. In 2002, lynx hair was detected on the Manti-La Sal National Forest in Utah. Before this, no lynx had been verified in Utah since 1991. This is most likely because forest habitat in Utah is remote and far away from source lynx populations (Appendix P).

The Ashley National Forest has no verified records of lynx occurrence since 1999 and is considered unoccupied. This unit is also identified as peripheral habitat in the FWS *Recovery Outline* because it contains few verified historical or recent records of lynx (USDI FWS, 2005a).

Lynx analysis unit (LAU)

An LAU is an area used to evaluate effects of management activities on individual lynx. It is about the size of a female lynx home range, from 15,000 to 30,000 acres or about 25 to 50 square miles.

Lynx risk factors

The LCAS identified the following risk factor categories that could affect lynx:

- *Productivity*
- *Mortality*
- *Movement*

This analysis evaluates how the alternatives affect these risk factors and to what degree.

Productivity risk factors

In the biological sense, *productivity* means the ability of an organism to successfully reproduce. Successful reproduction involves not only giving birth, but also whether the offspring survive into maturity, themselves capable of reproducing.

Lynx productivity is directly related to the quantity and quality of habitat and indirectly related to competition with predators. Productivity risk factors are:

- *Foraging habitat*
- *Denning habitat*
- *Competition from other predators*

This analysis focuses on the risks to foraging and denning habitat, and evaluates how competition from predators affects productivity.

A considerable amount of lynx research has been conducted in Alaska and Canada (Ruggiero et al. 2000a), documenting certain habitat needs and relationships. Research is also underway in the contiguous United States. See Appendix F for a summary.

Foraging habitat

Lynx foraging habitat is defined as habitat that supports snowshoe hares or red squirrels (LCAS).

Red squirrel habitat consists primarily of older, closed-canopied forests with substantial quantities of coarse woody debris.

Snowshoe hare habitat consists of (1) places where young trees or shrubs grow densely, often thousands of woody stems per acre or (2) places where mature forests grow which have high horizontal cover – meaning they have trees whose branches come down to snow level and a component of understory trees.

During winter, hare forage is limited to the twigs and stems that protrude above the snow and the hares can reach. *Since snowshoe hare forage is more limited during winter and hares are lynx primary winter prey, this analysis focuses on the effects of the alternatives to winter snowshoe hare habitat.* The terms *foraging habitat* and *winter snowshoe hare habitat* are used interchangeably in this analysis.

Vegetation that provides hares with hiding cover is also important.

Winter snowshoe hare habitat occurs in three stages of forest development, the *stand initiation, understory re-initiation,* and *old forest multistoried* structural stages.

Stand structural stages

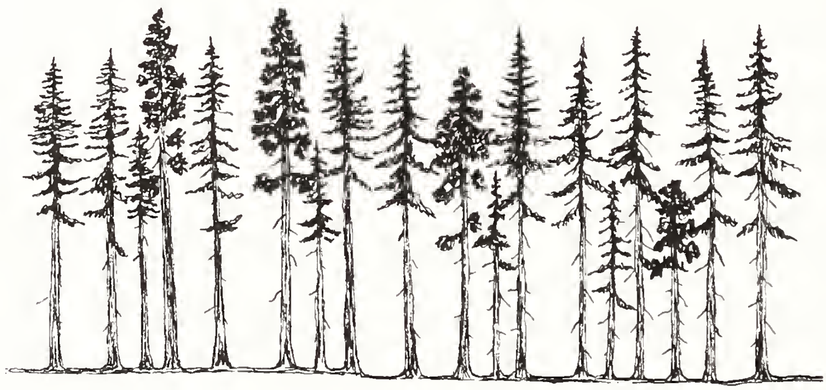
Figure 3-2. Vegetative structural stages and lynx habitat components

Structural stage	Description	Contribution to lynx habitat
Stand initiation, or young regenerating forests	After a stand replacing fire or regeneration harvest, new seedlings establish and develop. A single-story layer of shrubs, tree seedlings and saplings grow.	*Not used in the winter* for about the first ten to 30 years after disturbance because the trees and shrubs are not tall enough to protrude above the snow. May provide denning habitat. *Winter snowshoe hare habitat* after about ten to 30 years, if trees are dense enough and tall enough to protrude above the snowline in places that get deep snow.

Winter snowshoe hare habitat

Stem exclusion	Trees initially may grow fast, slowing down as they compete for sunlight and moisture. There is limited understory because little light reaches the forest floor.	Generally, not denning or hare habitat because the live tree crowns are too high, and the understory and dead and down material too limited.

Not winter snowshoe hare habitat



Structural stage	Description	Contribution to lynx habitat
Young forest multistoried	In this stage, three or more tree layers become established after minor disturbances kill some overstory trees.	Generally not winter snowshoe hare habitat because only a limited understory has developed within the reach of snowshoe hares. *Denning habitat* if there are piles of coarse woody material.

\- - -
***Not* winter snowshoe hare habitat**

Structural stage	Description	Contribution to lynx habitat
Understory reinitiation; one type of older multistoried forests	As the forest ages, some overstory trees begin to die or are removed, making openings where a new generation of understory trees can grow in a multistoried condition.	*Winter snowshoe hare habitat* if the understory is dense enough to provide cover and forage, and is within reach of hares. *Denning habitat* if there are piles of coarse woody material.

\- - -
Winter snowshoe hare habitat

Structural stage	Description	Contribution to lynx habitat
Old forest – single storied	Many generations and vegetation layers mark this structural class. It usually contains large old trees; decaying falling trees may be present, and it has no understory.	Generally not winter snowshoe hare habitat because it lacks the small understory trees that provide cover and forage for snowshoe hares. *Denning habitat* if there are piles of coarse woody material.

\- - -

***Not* winter snowshoe hare habitat**

Structural stage	Description	Contribution to lynx habitat
Old forest – multi-storied; the other older multistoried forest	Some old forests develop a multistoried structure with an understory.	*Winter snowshoe hare habitat* if understory is dense enough to provide cover and forage, and is within the reach of hares. *Denning habitat* because it generally provides plenty of large coarse woody material.

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Winter snowshoe hare habitat

Adapted from Oliver and Larson, 1996

Where & how winter snowshoe hare habitat occurs

High densities of young trees and shrubs occur in different stages of forest development – see Figure 3-3.

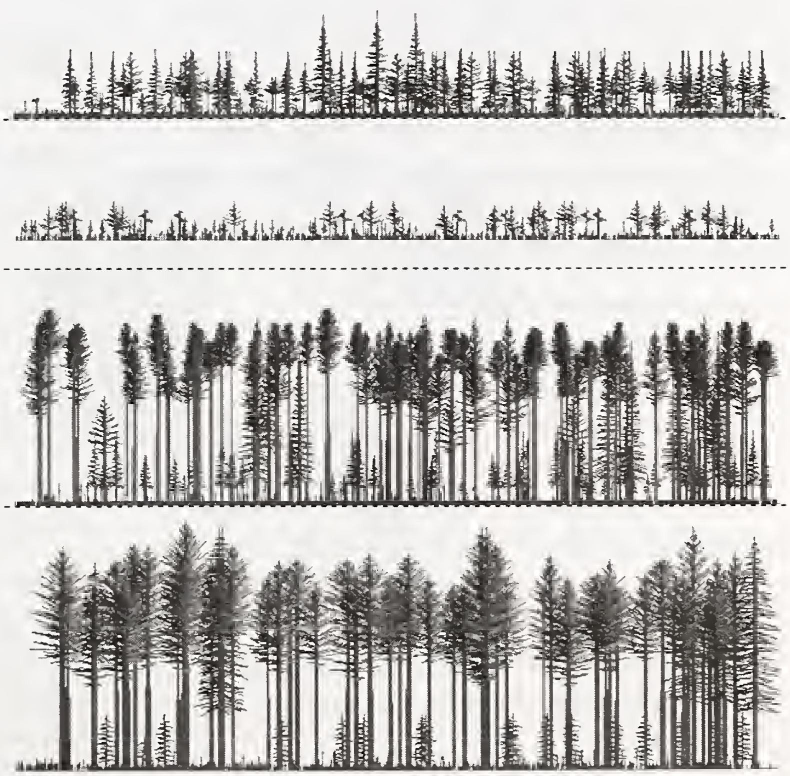
The *stand initiation stage* consists of young regenerating forests when the trees are all about the same age and size. Generally, about ten to 30 years after disturbance trees grow tall enough to provide good winter snowshoe hare habitat. Stand replacing fire and regeneration timber harvests can create these conditions. Many studies have shown hares prefer dense stands (Fuller 2006, Hodges 2000a, Hodges 2000b, McKelvey and McDaniel 2001, Shaw 2002).

Stand initiation structural stage that does not yet provide winter snowshoe hare habitat (previously called unsuitable habitat) consists of young regenerating forests when the trees and brush are generally less than ten to 30 years old and have not yet grown tall enough to protrude above the snow in winter. As time passes, the trees will grow taller and may provide *winter snowshoe hare habitat* if dense enough. Later, they will grow too tall and will be out the reach of snowshoe hares in winter.

The *understory reinitiation* and *old forest multistoried* are later stages in the life cycle of a forest. As the forest ages, tree heights begin to vary greatly, creating *multistoried*

Figure 3-3. Describing high and low density winter snowshoe hare habitat

High density young regenerating forests	5,000+ trees per acre
Low density young regenerating forests	2,500 - 5,000 trees per acre
High density undergrowth in multistoried forests	2,500+ small trees per acre
Low density undergrowth in multistoried forests	1,000 - 2,500 small trees per acre



forests. Multistoried forests can provide winter snowshoe hare habitat in places where small trees and shrubs grow thick enough to support snowshoe hares.

In northwest Montana, the highest snowshoe hare densities in summer were generally in younger forests with dense forest structure, whereas in winter, snowshoe hare densities were high or higher in mature forests with dense understory structure (USDI FWS 2005b).

Multistoried forest structures can develop from natural processes, such as insects and diseases and fire, or management actions like timber harvest can create small openings where trees and shrubs can grow.

In addition, the amount of winter snowshoe hare habitat across a landscape affects the abundance and density of snowshoe hares. In northeastern Washington, where lynx have existed for many years in areas where there was abundant, high quality winter snowshoe hare habitat, there were more hares than in areas where winter snowshoe hare habitat was sparse or surrounded by poorer quality habitat (USDI FWS 2005b).

Lynx evolved to adapt to an ever-changing forest condition. They require a mosaic of conditions of appropriate species composition, varying stand ages, and structure to support abundant snowshoe hare and lynx denning habitat. In addition, lynx are highly mobile, moving long distances to find abundant prey, and use a large area on the landscape as demonstrated by the large size of an average lynx home range (Appendix P).

Evaluating the amount of winter snowshoe hare habitat

For the purposes of this analysis, FIA data for Montana was used as a proxy to determine how much winter snowshoe hare habitat there may be (see FEIS, page 138 for a description of the data and its limitations). The query of the FIA data was developed in consultation with Kevin McKelvey and John Squires, research ecologist and wildlife research biologist, respectively, at the Rocky Mountain Research Station.

The analysis focuses on two variables – stand structure (mature or young) and stem density (number of trees per acre).

- It is likely young regenerating forests with 5,000 or more trees per acre less than five inches in diameter provide good foraging habitat (Ruggerio et al. 2000).
- Young regenerating forests with 2,500-5,000 trees per acre less than five inches in diameter may also provide foraging habitat depending on how the trees are distributed. Young forests with fewer trees may not provide enough cover for snowshoe hares.
- Multistoried forests with 2,500 or more trees per acre less than five inches in diameter in the understory also may provide good foraging habitat where small trees occur in dense, irregular clumps underneath the overstory.
- Multistoried forests with 1,000 to 2,500 trees per acre less than five inches in diameter in the understory may also provide good foraging habitat, depending on how the trees are

distributed. Multistoried forests with less than 1,000 trees per acre may not provide enough cover for snowshoe hares.

About 18 percent of the lynx habitat on NF lands in Montana is in young regenerating forests – about 10 percent has a high density of trees and 8 percent has a lower density. About 26 percent is in multistoried forests, which have been found to be an important habitat component in Montana. Sixteen percent of the multistoried forests have a high density of trees and 11 percent a lower density. The high density conditions are likely to be very good forage, the low density forests may or may not be, depending on site-specific conditions like the tree species and spacing.

See Table 3-2. The amount of young regenerating forests is likely less extensive than it was historically because so many wildfires have been suppressed during the last 80 years (Hillis et al. 2003). At the same time, fire suppression may have increased the amount of winter snowshoe hare habitat available in older multistoried forests.

Figure 3-4. Winter snowshoe hare habitat in Montana
Percent of lynx habitat in Montana

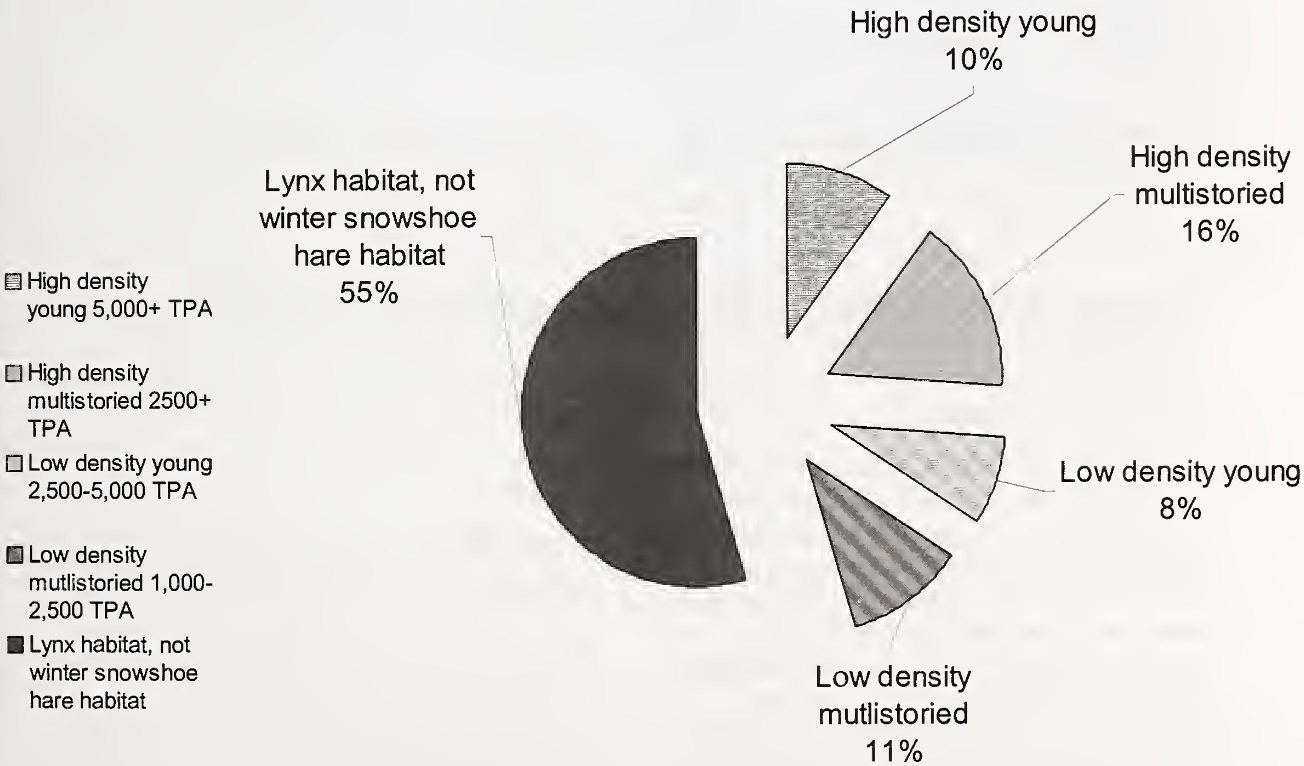


Table 3-2. Winter snowshoe hare habitat in Montana

	Area	Percent lynx habitat†	Percent NF lands‡
Young forests – to short for winter snowshoe hare habitat	~ 900,000 acres	10%	- - -
Winter snowshoe hare habitat	4,136,000 acres	45%	24%
HIGH DENSITY			
Total high density	**2,369,000 acres**	**26%**	**14%**
Young regenerating forests, with at least 5,000 trees per acre			
Wilderness	157,000 acres	2%	1%
Outside wilderness	737,000 acres	8%	4%
Total	894,000 acres	10%	5%
Multistoried forests, with at least 2,500 trees per acre			
Wilderness	355,000 acres	4%	2%
Outside wilderness	1,120,000 acres	12%	6%
Total	1,475,000 acres	16%	8%
LOW DENSITY			
Total low density	**1,754,000 acres**	**19%**	**10%**
Young regenerating forests, with from 2,500 to 5,000 trees per acre			
Wilderness	198,000 acres	2%	1%
Outside wilderness	546,000 acres	6%	3%
Total	744,000 acres	8%	4%
Multistoried forests, with from 1,000 to 2,500 trees per acre			
Wilderness	198,000 acres	2%	1%
Outside wilderness	812,000 acres	9%	5%
Total	1,010,000 acres	11%	6%

† 9,060,000 acres of lynx habitat in Montana
‡ 17,454,000 acres of NFS lands in Montana
Multistoried forests = plots with greater than or equal to 60 square feet of basal area in trees greater than 10 inches in diameter at breast height (DBH) (have an overstory component); and understory less than 5 DBH (have an understory component) with a height to live crown ratio of less than or equal to 5 feet (branches reach snow level).
Young regenerating forests = plots with less than 60 basal square feet per acre in trees greater than 10 inches in diameter (little to no overstory).
The amount of winter snowshoe hare habitat may be overstated because openings and small water bodies, for example, are too small to be discernable at the scale used in the analysis– see the discussion of analysis tools on pages 136 and 137.

Foraging habitat risks

Lynx productivity depends on the quantity and quality of foraging habitat. Foraging habitat may be affected by:

- Landscape patterns
- Precommercial thinning
- Other vegetation management practices
- Grazing

Landscape pattern risks to foraging habitat

A distribution of *age classes* is important so there are always parts of each LAU providing winter snowshoe hare habitat. Timber harvest, fire, insect outbreaks, avalanches, and wind all change landscape patterns. These actions can modify the quantity and quality of young regenerating forests, as well as multi-storied forests.

Fire plays an important role in lynx habitat. Stand-replacing fires burn mature forests and result in young regenerating forests. Fire suppression can alter the pattern and composition of vegetation within lynx habitat (Hillis 2003, Losensky 2002). These patterns, especially within stand-replacing fire regimes (spruce-fir and lodgepole pine communities), were likely important in providing young regenerating forests across the landscape.

- In *non-developmental allocations*, because of fire suppression, the large fires that used to burn have been fewer and smaller, so less foraging habitat has been created. Natural fires are allowed to burn but may not mimic historic fire patterns because of human concerns about large fires (Hickenbottom et al. 1999).
- In *developmental allocations*, fire suppression tends to be more aggressive and as a result may limit the creation of young regenerating forests. In developmental allocations, timber harvest can result in young regenerating forests (Ruggiero et al. 2000a). Studies of lynx and snowshoe hare have documented lynx presence and reproduction and snowshoe hare abundance in a variety of managed landscapes (Appendix P).

How sites are reforested can also change landscape patterns. Sometimes lodgepole pine is removed and western larch is planted or otherwise encouraged to grow, converting the forest from one predominant tree species to another – this is called a *type conversion*. Western larch may not provide winter forage for hares because it loses its needles and may not provide the vegetative cover hares need during winter.

Precommercial thinning risks to foraging habitat

Precommercial thinning reduces stem densities to increase the growth of the remaining trees. Precommercial thinning generally occurs when forests are 10 to 30 years old, about the same time young regenerating forests are beginning to provide winter snowshoe hare habitat.

Precommercial thinning may reduce stem densities and cover to the point that the young forests have little or no value for snowshoe hares (Ruggiero et al. 2000a). In northwest Montana, hares preferred dense, unthinned sapling patches

(Ausband and Baty 2005). Researchers found precommercial thinning decreased snowshoe hare abundance, compared to unthinned patches (control plots) and areas where 80 percent of the stand was thinned but 20 percent was unthinned (Griffin and Mills, JWM in press). Declines were prominent in the second winter after treatment. In addition, estimated survival rates decreased as individuals spent proportionally more time in open young and open mature forests (Griffin and Mills, JWM in press). Additional research on different thinning scenarios is ongoing – see Appendix F.

Other vegetation management risks to foraging habitat
In multistoried forests, some fuel treatments and commercial timber sales may reduce winter snowshoe hare habitat because the small trees and brush that constitute foraging habitat are removed. Other projects may remove only tall trees and create openings, allowing new foraging habitat to develop.

Grazing risks to winter snowshoe hare habitat
Livestock grazing may reduce or eliminate foraging habitat in areas that grow quaking aspen and willow in riparian areas (LCAS). These localized changes in habitat may affect individual lynx; however no information indicates that grazing poses a threat to overall lynx populations (Appendix P, p. 40083).

Foraging habitat under Alternative A, no action

The Biological Assessment (BA) the FS and BLM completed on existing plans, (Hickenbottom et al. 1999) found management direction generally lacking for foraging habitat – see Table 3-3.

Under the no-action alternative, management direction to conserve lynx would not be incorporated into the existing plans. Winter snowshoe hare habitat likely would decline both in quality and quantity.

Landscape patterns under Alternative A
Under Alternative A, wildfires would continue to be suppressed at current levels, removing fire as an ecosystem

Table 3-3. BA findings about whether existing plans are adequate to protect winter snowshoe hare habitat

	Fully or substantially	Marginally	Do not	Unknown or n/a
Fire management	30%	55%	15%	- - -
Landscape patterns	15%	70%	15%	- - -
Precommercial thinning	10%	55%	35%	- - -
Habitat conversions	5%	35%	60%	- - -
Foraging habitat	35%	65%	- - -	- - -

Fire management - Existing plans direct fire management to provide or improve lynx habitat
Landscape patterns - Existing plans results in landscape vegetation patterns suitable for lynx habitat
Precommercial thinning - Existing plans direct integrating lynx habitat needs in thinning projects
Habitat conversions - Existing plans prohibit conversions that reduce habitat suitability
Foraging habitat - Direction in existing plans would provide winter snowshoe hare habitat

driver creating foraging habitat. In development allocations where timber sales are allowed, regeneration timber harvest is not likely to make up for removing fire because of other resource considerations (Hillis et al. 2003).

In FS Region 1, less than 13 percent of the LAUs have more than 30 percent in young regenerating forests that do not yet provide winter snowshoe hare habitat. All were caused by wildfires in 1988 and 2000. About 13 percent had more than 15 percent in young regenerating forests (Hillis et al. 2003); timber harvest caused very few to exceed 15 percent in young regenerating forests that do not yet provide winter snowshoe hare habitat.

In some areas, it is possible for individual lynx to be affected because of the distribution of foraging habitat. Where large patches of very young regenerating forests have resulted from fire and timber harvest, these patches likely would become forage over time. Other places may lack young regenerating forests because they lack disturbance. Existing plans do not include management direction to provide a distribution of lynx habitat conditions.

Type conversions could occur and in some places reforestation could result in species that do not provide adequate winter cover for snowshoe hares.

Precommercial thinning under Alternative A
In the planning area 576,220 acres are scheduled for precommercial thinning over the next ten years; of this about 395,330 acres are in lynx habitat – see Table 3-4 and Appendix K, Table K-1. However, historically only 34 percent of the scheduled thinning has been funded. Based on historical funding about 133,000 acres may be thinned in lynx habitat over the next ten years.

Under Alternative A, the scheduled precommercial thinning (between 133,000 and 395,330 acres in lynx habitat) would likely occur in young regenerating forests that provide good winter snowshoe hare habitat. All thinning in lynx habitat would reduce winter snowshoe hare habitat which in turn would reduce snowshoe hare densities (Ruggerio et al. 2000, Griffin and Mills, in press).

For more information about thinning, see the *Forests* section later in Chapter 3; for a discussion about how funding affects thinning, see the *Economics* section.

Fuel treatments under Alternative A
Fuel treatments would not be limited under Alternative A. Fuel treatment projects have the potential to reduce or eliminate foraging habitat by removing understory vegetation that provides good winter forage. They are likely to reduce winter snowshoe hare habitat if they

Table 3-4. Lynx habitat scheduled for precommercial thinning or fuel treatments over the next decade under Alternative A

Treatment	Acres in lynx habitat
Precommercial thinning	395,330 acres
Fuel treatment	881,440 acres

reduce the density of small trees.

During the next decade, approximately 2 million acres within the planning area are scheduled for fuel treatment (Appendix M). About 881,000 acres would likely occur in lynx habitat (Table 3.5, next page). This amounts to about 4.8 percent of lynx habitat within the planning area. It is likely that some, but not all, of the treatments would reduce winter snowshoe hare habitat. For example, some fuel treatment projects may occur in mature lodgepole pine forests to break up the continuity of fuels – these forests generally lack the understory to provide winter snowshoe hare habitat. However, other forests, especially those in the mixed conifer type or spruce-fir type, may have a multistoried structure where removal of ladder fuels (understory trees that provide a source for fire to burn into the overstory) is desirable.

An analysis using Montana FIA and fuel treatment data was conducted to approximate the potential effects – see Table 3-5 and the discussion in the summary for effects of Alternative A.

Other vegetation management under Alternative A

Other vegetation management activities could occur in multistoried winter snowshoe hare habitat, such as using prescribed burning to restore whitebark pine. In some whitebark pine forests, understory trees may need to be removed before burning. During the next decade, about 50,000 acres of whitebark pine restoration could occur without using precommercial thinning. See the *Forests* and *Plants* sections later in Chapter 3.

Timber harvest could also affect foraging habitat, but how many acres might be affected depends on the number and size of site-specific projects implemented in the planning area See the *Forests* for a description of the kinds of management actions that take place.

Activities that remove foraging habitat would be detrimental to lynx; where foraging habitat is maintained or prolonged, that would be beneficial.

Under Alternative A, no changes would be made to incorporate management direction to prolong or protect winter snowshoe hare habitat.

Grazing under Alternative A

About 1,765 active grazing allotments overlap lynx habitat in the planning area. About 15 percent lack management strategies that result in habitat conditions favorable for lynx. Under Alternative A, grazing on these allotments may reduce hare foraging habitat in aspen, willows and riparian areas, or in shrub-steppe areas, which could reduce localized habitat conditions favorable for lynx.

Summary of effects on foraging habitat under Alternative A

To evaluate the combined effects of precommercial thinning, fuel treatments and whitebark pine restoration, an analysis was done for Montana. Only Montana was included because FIA data was readily available only for this state (see pages 138 and 150 for further information). The effects on foraging habitat in the other planning-area states are likely to be similar to the effects in Montana.

Table 3-5. Montana hare forage affected under Alternative A in a decade with full funding

	High density young 894,000 ac	High density multistory 1,475,000 ac	Total high density 2,369,000 ac	Low density young 744,000 ac	Low density multistory 1,010,100 ac	Total low density 1,754,000 ac
Precommercial thinning (acres)	213,000	0	213,000	0	0	0
Fuel treatment (acres)	0	71,000	71,000	0	60,000	60,000
Whitebark pine restoration (acres)	40,000	0	40,000	0	0	0
No treatment (acres)	641,000	1,404,000	2,045,000	744,000	950,000	1,694,000
Percent winter snowshoe hare habitat treated	28%[1]	5%[2]	14%[3]	0%[4]	6%[5]	3%[6]
Timber harvest	No effect	Number of acres depends on number and size of projects– some detrimental, some beneficial	Number of acres depends on number and size of projects – some detrimental, some beneficial	No effect	Number of acres depends on number and size of projects – some detrimental, some beneficial	Number of acres depends on number and size of project s – some detrimental, some beneficial
Grazing	Some hare forage could be reduced in local areas on 250 allotments	No effect	No effect	Some hare forage could be reduced in local areas on 250 allotments	No effect	Some hare forage could be reduced in local areas on 250 allotments

[1] 213,000 + 0 + 40,000 / 894,000 = 28%
[2] 0 + 71,000 +0/ 1,475,000 = 5%
[3] 213,000 + 71,000 + 40,000 / 2,369,000 =14%
[4] 0 + 0 + 0 / 744,000 =0%
[5] 0 + 60,000 + 0/ 1,010,000 = 6%
[6] 0 + 60,000 + 0 /1,754,000 = 3%

Assumptions

Precommercial thinning and whitebark pine restoration would occur only in high-density winter snowshoe hare habitat and would be fully funded

Fuel treatment would occur in proportion to the amount of forested habitat (Appendix M)

Other information

About 213,000 of the 395,330 acres of precommercial thinning scheduled in lynx habitat in the planning area, are in Montana (Appendix K, Table K2).

About 131,200 of the 881,440 acres of fuel treatment in lynx habitat in the planning area projected for the next decade are in Montana and would occur in high or low density winter snowshoe hare habitat (Appendix M)

About 40,000 of the 50,000 acres of whitebark pine restoration scheduled in lynx habitat in the planning area are in Montana

The analysis assumes precommercial thinning and whitebark pine restoration would occur in high density forests. About 213,000 acres of precommercial thinning and 40,000 acres of white-bark pine restoration are scheduled in Montana over the next ten years. These activities may reduce winter snowshoe hare habitat on about 28 percent of high density young forests (see Table 3-5). Precommercial thinning may result in the greatest effect since almost a quarter of the high-density young forests would be thinned at full funding.

These estimates are likely high because in the recent past, precommercial thinning has been funded only about 34 percent (see the *Economics* section) and because whitebark pine restoration in lynx habitat may not occur to the extent predicted.

Fuel treatment projects may affect winter snowshoe hare habitat found in multistoried forests. The analysis assumes fuel treatment projects would occur in proportion to their occurrence (see Appendix M). In Montana, about 337,000 acres of fuel treatment is likely to occur in lynx habitat over the next decade. Of that about 131,000 acres may be in winter snowshoe hare habitat.

Fuel treatments could reduce 5 percent of high density multistoried winter snowshoe hare habitat and 6 percent of low density multistoried winter snowshoe hare.

In lynx habitat, many of the forests have not missed a fire cycle, so even though they are subject to crown fires, fewer fuel treatments may occur. It is likely the priority for fuel treatments would be outside lynx habitat (see the *Fire* section later in Chapter 3).

Other timber harvest could occur in multistoried forests however the amount that may be affected depends on number, size, and location of site-specific projects. In general, many timber harvest projects would reduce foraging habitat; although some projects may improve the habitat by creating small openings for new understory to develop.

Foraging habitat under Alternative B

Alternative B would add management direction to existing plans promoting winter snowshoe hare habitat. Table 2-1 in Chapter 2 contains the full text.

- Objectives VEG O1, VEG O2, VEG O3, VEG O4 and GRAZ O1 support emulating historic disturbances that would create and maintain foraging habitat.
- Standards VEG S1, VEG S2, VEG S5, VEG S6, GRAZ S1, GRAZ S2, GRAZ S3 and GRAZ S4 are discussed below.
- Guideline VEG G1 emphasizes considering creating more foraging habitat where it is lacking.

Landscape patterns under Alternative B

Objective VEG O1 describes managing vegetation similar to historic disturbance processes. Objective VEG O3 describes conducting fire use activities to restore ecological processes and maintain or improve lynx habitat. Objective VEG O4 describes designing regeneration harvest and reforestation to develop characteristics suitable for winter snowshoe hare habitat.

Standards VEG S1 and VEG S2 limit how much lynx habitat in an LAU can be regenerated by vegetation management. The overall limit is no more than 30 percent of an LAU would be in young forests that do not provide winter snowshoe hare habitat; timber harvest is limited to 15 percent in a decade. Under Alternative B, these standards could limit prescribed fire and timber harvest at the scale of an LAU. They would help provide an even flow of winter snowshoe hare habitat over time.

Alternative B also includes Guideline VEG G1 that encourages creating winter snowshoe hare habitat where it is lacking.

Precommercial thinning under Alternative B
Standards VEG S5 and VEG S6 would not allow precommercial thinning while forests provide winter snowshoe hare habitat; except precommercial thinning would be allowed within 200 feet of buildings.

During the next decade, precommercial thinning would be allowed on an estimated 2,200 acres within 200 feet of buildings - see Table 3-6. This is likely to have a negligible effect on lynx because of the small, scattered acreage and its proximity to human activity.

Precommercial thinning would not be allowed or would be deferred on between 132,000 to 394,000 acres (depending on funding levels). Winter snowshoe hare forage would be maintained on these acres which would benefit lynx.

Fuel treatments under Alternative B
During the next decade about 881,000 acres of fuel treatments are projected to occur in lynx habitat. Alternative B would restrict fuel treatments done by precommercial or understory thinning in young regenerating forests and multi-storied forests. Prescribed burning or timber harvest could be used to reduce fuels because they are not specifically prohibited. It is likely that these activities would occur in multistoried forests. Removal of winter snowshoe hare habitat in these situations would be detrimental.

An analysis using Montana FIA and fuel treatment data was conducted to approximate the potential effects - see Table 3-7 and the discussion in the summary of effects of Alternative B.

Other vegetation management under Alternative B
Alternative B does not restrict timber harvest from removing foraging habitat. Some foraging habitat could be lost depending on project design, but how much is not known. Projects could be beneficial in multistoried forests if they prolonged or maintained the small trees and brush that constitute hare habitat, but detrimental if they removed the undergrowth.

Table 3-6. Lynx habitat that could be thinned next decade under Alternative B

Precommercial thinning	Acres winter snowshoe hare habitat
Within 200 feet of administrative sites, dwellings or outbuildings	2,190 acres

Grazing under Alternative B

Standards GRAZ S1, GRAZ S2, GRAZ S3 and GRAZ S4 would ensure livestock grazing in lynx habitat was managed in ways that make it possible for trees, shrubs, and aspen to regenerate. Shrub-steppe habitat and riparian areas would be managed similar to historic conditions, helping maintain and provide foraging habitat and cover.

Summary of effects on foraging habitat under Alternative B

About 1,000 acres of precommercial thinning in Montana would be allowed under Alternative B.

Table 3-7. Hare forage affected under Alternative B in a decade with full funding – Montana

	High density young 894,000 ac	High density multistory 1,475,000 ac	Total high density 2,369,000 ac	Low density young 744,000 ac	Low density multistory 1,010,100 ac	Total low density 1,754,000 ac
Precommercial thinning (acres)	1,000	0	1,000	0	0	0
Fuel treatment (acres)	0	29,000	29,000	0	26,000	26,000
Whitebark pine restoration (acres)	40,000	0	40,000	0	0	0
No treatment (acres)	853,000	1,446,000	2,299,000	744,000	984,000	1,728,000
Percent winter snowshoe hare habitat treated	5%[1]	2%[2]	3%[3]	0%[4]	3%[5]	2%[6]
Timber harvest	No effect	Number of acres depends on number and size of project s – some detrimental, some beneficial	Number of acres depends on number and size of project s – some detrimental, some beneficial	No effect	Number of acres depends on number and size of project s – some detrimental, some beneficial	Number of acres depends on number and size of project s – some detrimental, some beneficial
Grazing	No effect	No effect	No effect	No effect	No effect	No effect

[1] 1,000 + 0 + 40,000 / 894,000 = 5%

[2] 0 + 29,000 + 0 / 1,475,000 = 2%

[3] 1,000 + 29,000 + 40,000 / 2,369,000 = 3%

[4] 0 + 0 + 0 / 744,000 =0%

[5] 0 + 26,000 + 0 / 1,010,000 = 3%

[6] 0 +26,000 /1,754,000 = 2%

Assumptions

Whitebark pine restoration would occur only in high-density winter snowshoe hare habitat.

No fuel treatment in young regenerating forests since precommercial thinning is prohibited.

Assumes 75 percent of fuel treatment in multistoried forests would be done without precommercial thinning (e.g. would be a commercial thin or regeneration harvest, which is not prohibited by the standards)

Other information

About 1,000 of the 2,190 acres of precommercial thinning scheduled in lynx habitat in the planning area, are in Montana (Appendix K, Table K2)

Whitebark pine restoration would not be affected because the standards do not prohibit prescribed burning.

Precommercial thinning and whitebark pine restoration may reduce winter snowshoe hare habitat on about 5 percent of high density young forests (see Table 3-7). Whitebark pine restoration may result in the greatest effect since over 4 percent of high-density young forests would be affected by this activity.

In Alternative B fuel treatments would not be accomplished through precommercial thinning; therefore there would be no effect to young regenerating forests due to this activity.

Fuel treatments could occur if some other method is used, such as commercial thinning, prescribed burning, or regeneration harvest. These activities are likely to occur in multistoried forests. The analysis assumes approximately 75 percent could be accomplished in multistoried forests through some other type of treatment. In Montana, about 131,000 acres of fuel treatment is projected to occur in winter snowshoe hare habitat, found in both young and multistoried forest, if there are no constraints. Under Alternative B, about 55,000 acres of winter snowshoe hare habitat in multistory forests could be affected by fuel treatment projects (assuming areas are treated in proportion to their occurrence—see Appendix M).

Fuel treatments could reduce 2 percent of high density multistoried winter snowshoe hare habitat and 3 percent of low density multistoried habitat.

Foraging habitat under Alternative C

Alternative C would add the same management direction as the Proposed Action, except:

- Standards VEG S1, VEG S5, and VEG S6 are changed as discussed below
- Standard VEG S2 is replaced by Guideline VEG G6

Landscape patterns under Alternative C

Standard VEG S1 would increase the size of the area to which the 30 percent limit was applied to an LAU or a fixed combination of adjacent LAUs.

Fire has been documented to occur in the planning area at scales many times larger than a single LAU or even multiple LAUs (Hillis et al. 2003). The LCAS identified historic fire disturbance patterns as a desired condition of lynx habitat. Expanding the size of the area would allow projects that more closely reflect historic fire disturbance patterns.

Compared to Alternative B, it is possible individual lynx would more likely be affected by expanding the size of area, because an LAU may have large patches of very young regenerating forests. However, because the multiple-LAU scale comes closer to historic disturbance patterns than a single LAU, Alternative C may provide greater benefits to lynx populations as a whole over the long term.

In Alternative C Standard VEG S2 is replaced by Guideline VEG G6. The amount of timber harvest resulting in young regenerating forests during a decade would have to be considered, but not limited if justified by other needs. In FS Region 1, timber harvest has resulted in more than 15 percent young regenerating

forests that do not yet provide winter snowshoe hare habitat in 13 percent of the LAUs (Hillis et al. 2003). The change to a guideline is likely to have limited effect.

Guideline VEG G1, encouraging projects that create or extend forage habitat, is changed to target the stem exclusion stage, which has little or no value for snowshoe hares.

Precommercial thinning under Alternative C
In young regenerating forests, precommercial thinning would most likely be the activity restricted because few other vegetation management projects occur. About 3,900 acres of precommercial thinning during the next decade would be allowed – see Table 3-8. The effects on lynx are likely minimal because most projects would take place near some form of human habitation.

Precommercial thinning would not be allowed or would be deferred on between 131,000 to 391,000 acres (depending on funding levels). Winter snowshoe hare forage would be maintained on these acres which would benefit lynx.

Fuel treatment projects under Alternative C
During the next decade about 881,000 acres of fuel treatments are projected to occur in lynx habitat. Under Alternative C, all fuel treatment projects would be designed to meet the standards, or dropped or deferred. No fuel treatment projects would reduce winter snowshoe hare habitat which would benefit lynx.

Other vegetation management projects under Alternative C
Alternative C modifies Standards VEG S5 and VEG S6 to apply to all vegetation management projects not just precommercial thinning. The only projects allowed would be research, genetic tree tests, and within 200 feet of buildings.

In multistoried forests, only research projects and precommercial thinning within 200 feet of buildings would be allowed. How many acres this amounts to depends on the number and size of site-specific projects. It is likely few acres would be affected.

Alternative C would preclude prescribed burning for white pine restoration as well as most other activities that could reduce winter snowshoe hare habitat. In effect, Alternative C retains most winter snowshoe hare habitat; therefore there would be minimal effect to lynx.

An analysis using Montana FIA and fuel treatment data was conducted to approximate the potential effects – see table 3-9 and the discussion in the summary of effects of Alternative C.

Grazing under Alternative C
Grazing direction would ensure livestock grazing in lynx habitat was managed in

Table 3-8. Lynx habitat that could be thinned next decade under Alternative C

Precommercial thinning	Acres winter snowshoe hare habitat
For research	1,450 acres
For genetic tree tests	220 acres
Within 200 feet of administrative sites, dwellings or outbuildings	2,190 acres
Total	3,860 acres

ways that make it possible for trees, shrubs, and aspen to regenerate. Shrub-steppe habitat and riparian areas would be managed similar to historic conditions, helping maintain and provide foraging habitat and cover.

Summary of effects on foraging habitat under Alternative C

Alternative C precludes most activities that reduce winter snowshoe hare habitat; therefore it has very minimal effect, if any to lynx.

Precommercial thinning on 3,000 acres in Montana would be allowed under Alternative C. In addition, no whitebark pine restoration activities would take place. Less than one-half of one percent of winter snowshoe hare habitat in young regenerating forests could be reduced.

No fuel treatment projects would be allowed that reduce winter snowshoe hare habitat; therefore all habitat in multistoried forests would be retained, which would benefit lynx.

Habitat does not remain static over time – some kind of disturbance is needed to maintain the dense understory favorable for snowshoe hares in multistoried forests. Alternative C would depend more heavily on natural processes to do the job.

Table 3-9. Hare forage affected under Alternative C in a decade with full funding - Montana

	High density young 894,000 ac	High density multistory 1,475,000 ac	Total high density 2,369,000 ac	Low density young 744,000 ac	Low density multistory 1,010,100 ac	Total low density 1,754,000 ac
Precommercial thinning (acres)	3,000	0	3,000	0	0	0
Fuel treatment (acres)	0	0	0	0	0	0
Whitebark pine restoration (acres)	0	0	0	0	0	0
No treatment (acres)	891,000	1,475,000	2,366,000	744,000	1,010,000	1,754,000
Percent winter snowshoe hare habitat treated	0.3%[1]	0%[2]	0.1%[3]	0%[4]	0%[5]	0%[6]
Timber harvest	No effect	No effect	No effect	No effect	No effect	No effect
Grazing	No effect	No effect	No effect	No effect	No effect	No effect

[1] 3,000 / 894,000 = 0.3%
[2] 0 + 0 + 0 / 1,475,000 =0%
[3] 3,000 + 0 + 0 / 2,369,000 =0.1%
[4] 0 + 0 + 0/ 744,000 =0%
[5] 0 + 0 + 0 / 1,010,000 = 0%
[6] 0 + 0 + 0 /1,754,000 = 0%

Assumptions

Whitebark pine restoration would occur only in high-density winter snowshoe hare habitat.

No fuel treatment in young regenerating forests since precommercial thinning is prohibited.

Assumes 75 percent of fuel treatment in multistoried forests would be done without precommercial thinning (e.g. would be a commercial thin or regeneration harvest, which is not prohibited by the standards)

Other information

About 1,000 of the 2,190 acres of precommercial thinning scheduled in lynx habitat are in Montana (Appendix K, Table K2)

Foraging habitat under Alternative D

Alternative D would add the same management direction as Alternative C, except the scale at which Standard VEG S1 would be applied is changed, and more activities are permitted under Standards VEG S5 and VEG S6.

Landscape patterns under Alternative D
Standard VEG S1 would further increase the size of the area to which the 30 percent in very young regenerating forests is applied, to a sub-basin or isolated mountain range. An area of this size is large enough to mimic large-scale historic disturbance patterns, such as large fires.

Under Alternative D, it is even more possible that individual lynx could be affected, because the distribution of foraging habitat over broad areas is more likely to fluctuate than under Alternatives B or C. Whole LAUs could end up in very young regenerating forests, similar to what may have happened under natural disturbance patterns. However, because the sub-basin or isolated mountain range scale would allow historic disturbance patterns to be fully factored in, Alternative D may provide greater long-term benefits to lynx populations as a whole.

The requirement to restrict timber-harvest-created young regenerating forests to 15 percent is dropped. Timber harvest has resulted in exceeding the 15 percent requirement in less than 13 percent of the LAUs in FS Region 1 (Hillis et al. 2003). It is unlikely extensive regeneration harvest would occur anyway because of concerns about other resources; so dropping this standard is likely to have a limited effect.

Precommercial thinning under Alternative D
Standards VEG S5 and VEG S6 would allow some vegetation management projects that reduce foraging habitat.

Table 3-10. Lynx habitat that could be thinned next decade under Alternative D

Precommercial thinning	Acres winter snowshoe hare habitat
Research	1,450 acres
Genetic tree tests	220 acres
Within 200 feet of administrative sites, dwellings or outbuildings	2,190 acres
Aspen	3,050 acres
Whitebark pine	9,110 acres
Lodgepole pine	34,550 acres
Subtotal	*50,570 acres*
Daylight thinning where 80% of the cover is retained	
Planted western white pine	51,090 acres
Ponderosa pine	11,660 acres
Western larch	123,160 acres
Subtotal daylight thinning only	*186,000 acres*
Total	236,480 acres

20% snowshoe hare forage may be reduced on day light thinning acres = 20% of 186,000 = 37,200 acres + 50,570 acres traditional thinning = 87,770 acres where snowshoe hare forage may be reduced

In young regenerating forests, precommercial thinning would be allowed in the following situations:

- Research could be done
- Genetic tree tests could occur
- Vegetation could be thinned within 200 feet of administrative sites, dwellings, and outbuildings
- Conifers could be thinned out around aspen
- Thinning and prescribed fire could be done to restore whitebark pine or to develop future old growth characteristics in lodgepole pine

Daylight thinning – where the competitors are weeded out from around selected trees – could occur around western larch, ponderosa pine, and planted rust-resistant western white pine if 80 percent of the hare forage is retained. Daylight thinning may have a less detrimental effect on snowshoe hares than traditional thinning since so much cover is retained, but it is unknown how hares would respond.

Forage is likely to be reduced somewhere from 87,000 to 236,480 acres during the next decade (depending on funding levels). Retaining 80 percent of the cover in the 186,000 acres of daylight thinning may reduce the loss of foraging habitat. The worst-case scenario would be that winter snowshoe hare habitat would be greatly reduced on all thinned acres – see Table 3-10.

Precommercial thinning would not be allowed or would be deferred on between 45,000 to 159,000 acres (depending on funding levels). Winter snowshoe hare forage would be maintained on these acres which would benefit lynx.

Fuel treatment projects under Alternative D
During the next decade about 881,000 acres of fuel treatments are projected to occur in lynx habitat. Under Alternative D, all fuel treatment projects would be designed to meet the standards, or dropped or deferred. No fuel treatment projects would reduce winter snowshoe hare habitat.

Other vegetation management projects under Alternative Din multistoried forests
Alternative D would preclude most vegetation management in multi-storied forests. Projects could be done to restore western larch, ponderosa pine, and planted white pine where 80 percent of the cover is retained. Whitebark pine restoration projects also would be allowed.

Vegetation management projects could occur if it improved or maintained foraging habitat in the long term. Small openings could be created or mid-height trees removed so small trees and brush could grow. How many acres might be involved is unknown.

Grazing under Alternative D
Grazing direction would ensure livestock grazing in lynx habitat was managed in ways that make it possible for trees, shrubs, and aspen to regenerate. Shrub-steppe habitat and riparian areas would be managed similar to historic conditions, helping maintain and provide foraging habitat and cover.

Summary of effects on foraging habitat under Alternative D

Precommercial thinning on 139,000 acres in lynx habitat in Montana would be allowed under Alternative D, affecting about 15 percent of high density forage found in young regenerating forests. An additional 5 percent could be reduced by whitebark pine restoration projects.

In multistoried forests there would be no reduction to winter snowshoe hare habitat from fuel treatment projects - see Table 3-11. This would benefit lynx by retaining this habitat component.

Some other type of activities could occur in multistoried forests, however the amount is unknown. Most of the exceptions in Alternative D really apply to activities in young forests.

Projects that prolong or maintain forage habitat could have either no effect or a beneficial effect over time.

Foraging habitat under Alternative E

Landscape patterns under Alternative E
Alternative E has the same objectives as Alternative B, and Guideline VEG G1 is the same as under Alternative C.

Table 3-11. Hare forage affected under Alternative D in a decade with full funding - Montana

	High density young 894,000 ac	High density multistory 1,475,000 ac	Total high density 2,369,000 ac	Low density young 744,000 ac	Low density multistory 1,010,100 ac	Total low density 1,754,000 ac
Precommercial thinning (acres)	139,000	0	139,000	0	0	0
Fuel treatment (acres)	0	0	0	0	0	0
Whitebark pine restoration (acres)	40,000	0	40,000	0	0	0
No treatment (acres)	715,000	1,475000	2,190,000	744,000	1,010,000	1,754,000
Percent winter snowshoe hare habitat treated	20%[1]	0%[2]	8%[3]	0%[4]	0%[5]	0%[6]
Timber harvest	No effect	Likely minor some detrimental, some beneficial	Likely minor some detrimental, some beneficial	No effect	Likely minor some detrimental, some beneficial	Likely minor some detrimental, some beneficial
Grazing	No effect	No effect	No effect	No effect	No effect	No effect

[1] 139,000 + 40,000 / 894,000 = 20%
[2] 0 + 0 + 0/1,475,000 = 0%
[3] 139,000 + 0 + 40,000 / 2,369,000 = 8%
[4] 0 + 0 + 0/ 744,000 =0%
[5] 0 + 0 + 0/ 1,010,000 = 0%
[6] 0 + 0 + 0 /1,754,000 = 0%

Other information
No fuel treatments would occur
About 139,000 of the 236,500 acres of precommercial thinning allowed are in Montana (Appendix K, Table K-2)
About 40,000 of the 50,000 acres of whitebark pine restoration are in Montana

Standard VEG S1 would apply the 30 percent in very young regenerating forests based on an LAU or a fixed combination of adjacent LAUs, the same as in Alternative C. Alternative E would not limit fuel treatment projects that create young regenerating forests. Fuel treatment may proceed even if an LAU already exceeds 30 percent in very young regenerating forests. Since this situation describes only a few LAUs and they're recently burned areas, they're unlikely to need fuel treatment in the near future.

Alternative E does not include Standard VEG S2 which restricts timber harvest from creating more than 15 percent in a stand initiation structural stage over a 10 year period. In some areas timber harvest may exceed this value although it is not expected to occur often. This is because very few LAUs encounter this situation now and since timber harvest levels are lower than they were in the 1990s it is unlikely timber harvest would regenerate more than 15 percent of an LAU.

Precommercial thinning under Alternative E
Alternative E would allow precommercial thinning projects in young regenerating forests for fuel treatment, research, genetic tree tests, and within 200 feet of buildings. About 3,900 acres could be precommercially thinned – see Table 3-12. The effects on lynx are likely minimal because most projects would take place near some form of human habitation.

Precommercial thinning would not be allowed or would be deferred on between 131,000 to 391,000 acres (depending on funding levels). Winter snowshoe hare forage would be maintained on these acres which would benefit lynx.

Fuel treatment projects under Alternative E
Fuel treatments developed in a collaborative manner would not be limited under Alternative E. About 881,000 acres are projected to occur in lynx habitat (see Appendix M). This amounts to about 4.8 percent of lynx habitat within the planning area.

Fuel treatment projects have the potential to reduce or eliminate foraging habitat by removing understory vegetation that provides good winter forage. It is likely that some, but not all, the treatments would reduce winter snowshoe hare habitat. For example some fuel treatment projects may occur in mature lodgepole pine forests to break up the continuity of fuels – these forests generally lack the understory to provide winter snowshoe hare habitat. However, other forests, especially those in the mixed conifer type or spruce-fir type, may have a multi-storied structure where removal of ladder fuels (understory trees that provide a source for fire to burn into the overstory) is desirable.

Table 3-12. Lynx habitat that could be thinned next decade under Alternative E

Precommercial thinning	Acres winter snowshoe hare habitat
Research	1,450 acres
Genetic tree tests	220 acres
Within 200 feet of administrative sites, dwellings or outbuildings	2,190 acres
Total	3,860 acres

An analysis using Montana FIA and fuel treatment data was conducted to approximate the potential effects to winter snowshoe hare habitat – see Table 3-13 and the discussion in the summary of effects for Alternative E.

Other vegetation management projects under Alternative E

Under Alternative E, Standard VEG S5 only limits precommercial thinning, as in Alternative B, not all vegetation projects, as in Alternatives C and D. Activities, such as prescribed burning to restore whitebark pine would be allowed under Alternative E.

Under Alternative E, Standard VEG S6 is replaced by Guideline VEG G8. Winter snowshoe hare habitat in multistory forests would have to be considered when designing projects, but the projects could remove forage habitat when justified by other needs.

Table 3-13. Montana hare forage affected under Alternative E in a decade with full funding

	High density young 894,000 ac	High density multistory 1,475,000 ac	Total high density 2,369,000 ac	Low density young 744,000 ac	Low density multistory 1,010,100 ac	Total low density 1,754,000 ac
Precommercial thinning (acres)	3,000	0	3,000	0	0	0
Fuel treatment (acres)	0	71,000	71,000	0	60,000	60,000
Whitebark pine restoration (acres)	40,000	0	40,000	0	0	0
No treatment (acres)	851,000	1,404,000	2,255,000	744,000	950,000	1,694,000
Percent winter snowshoe hare habitat treated	5%[1]	5%[2]	5%[3]	0%[4]	6%[5]	3%[6]
Timber harvest	No effect	Number of acres depends on number and size of projects – some detrimental, some beneficial	Number of acres depends on number and size of projects – some detrimental, some beneficial	No effect	Number of acres depends on number and size of projects– some detrimental, some beneficial	Number of acres depends on number and size of projects– some detrimental, some beneficial
Grazing	No effect	No effect	No effect	No effect	No effect	No effect

[1] 1,000 + 0 + 40,000 / 894,000 = 5%
[2] 0 + 71,000+ 0 / 1,475,000 = 5%
[3] 3,000 + 71,000 + 40,000 / 2,369,000 = 5%
[4] 0 + 0 + 0 / 744,000 =0%
[5] 0 + 60,000 + 0 / 1,010,000 =6%
[6] 0 + 60,000 + 0 /1,754,000 = 3%

Other information

About 3,000 of the 4,000 acres of precommercial thinning scheduled in lynx habitat are in Montana (Appendix K, Table K2)
All fuel treatment projected to occur in high and low density winter snowshoe hare habitat would take place (Appendix M)
Whitebark pine restoration would take place
40,000 of the 50,000 acres of whitebark pine restoration scheduled are in Montana

Grazing under Alternative E
Grazing standards are replaced by guidelines under Alternative E. If the guidelines are not followed in some areas then potential snowshoe hare habitat could be reduced which may affect an individual lynx. However, there is no information that grazing poses a threat to lynx populations (Appendix P); therefore the effects would only be localized and would not affect the population as a whole.

Summary of effects on foraging habitat under Alternative E
About 3,000 acres of precommercial thinning in Montana would be allowed under Alternative E.

Whitebark pine restoration would not be affected because the standards do not prohibit prescribed burning.

Precommercial thinning and whitebark pine restoration may reduce winter snowshoe hare habitat on about 5 percent of high density young forests - see Table 3-13. Whitebark pine restoration may result in the greatest effect since over 4 percent of high-density young forests would be affected by this activity.

Standard VEG S6 is changed to Guideline VEG G8. Fuel treatments would not be precluded if a reason warrants deviation from the guideline. In Montana, about 131,000 acres of fuel treatment project are projected to occur in winter snowshoe hare habitat if there are no constraints. Under Alternative E, it is assumed all of these projects would proceed and they would reduce winter snowshoe hare habitat. In lynx habitat, many of the forests have not missed a fire cycle, so even though they are subject to crown fires, fewer fuel treatments may occur. It is likely the priority for fuel treatments would be outside lynx habitat - see the *Fire* section later in Chapter 3.

Fuel treatments could reduce 5 percent of high density multistoried winter snowshoe hare habitat and 6 percent of low density multistoried winter snowshoe hare.

Foraging habitat under Alternative F

Landscape patterns under Alternative F
Alternative F includes objectives to provide a mosaic of habitat conditions through time (VEG O1 and VEG O2).

Standards VEG S1 and VEG S2 limit how much lynx habitat in an LAU can be a stand initiation structural stage that does not yet provide winter snowshoe hare habitat. VEG S1 applies to all vegetation projects and limits the amount to 30 percent. VEG S2 applies to timber harvest and limits the amount to 15 percent in a ten-year period.

Fuel treatment projects within the WUI would be exempt from these standards, within limits. The number of acres exempt from Standards VEG S1, VEG S2, VEG S5, and VEG S6 would be capped at six percent of the lynx habitat on a national forest. In addition, Guideline VEG G10 encourages fuel treatment projects within the WUI to consider the standards in the design of the project.

Only a few LAUs have more than 30 percent in very young regenerating forests or 15 percent of young forests created by timber harvest; therefore it is unlikely many fuel treatment projects would

exceed these standards. For those projects that do exceed the standards they could create more young forests than desired and not provide the desirable mosaic of habitat conditions for lynx.

Precommercial thinning under Alternative F
Under Alternative F, Standard VEG S5 only limits precommercial thinning, as in Alternatives B and E, not all vegetation projects, as in Alternatives C and D. Alternative F would allow precommercial thinning projects in young regenerating forests within 200 feet of buildings, for research and genetic test sites, for whitebark pine and aspen restoration, and around planted rust-resistant western white pine. About 67,000 acres could be precommercially thinned – see Table 3-14. Retaining 80 percent of the cover in the 51,000 acres of daylight thinning may reduce the loss of foraging habitat. The worst-case scenario would be that winter snowshoe hare habitat would be greatly reduced on all thinned acres.

In addition, precommercial thinning could also occur with the WUI if done for a fuel treatment purpose. The number of acres done for this purpose is unknown. Winter snowshoe hare habitat and the quality of lynx habitat would be reduced on those acres thinned.

Precommercial thinning would not be allowed or would be deferred on between 111,000 to 328,000 acres (depending on funding levels). Winter snowshoe hare forage would be maintained on these acres which would benefit lynx.

Fuel treatment projects under Alternative F
During the next decade about 881,000 acres of fuel treatments are projected to occur in lynx habitat. Of this about 284,000 acres (or about 3 percent of lynx habitat) are projected to be in lynx habitat in the WUI – see Appendix M. Under Alternative F, up to 6 percent of lynx habitat in the WUI could have fuel treatment projects that do not meet the vegetation standards. For those projects that occur in winter snowshoe hare habitat they would likely reduce this habitat component.

An analysis using Montana FIA and fuel treatment data was conducted to approximate the potential effects to winter

Table 3-14. Lynx habitat that could be thinned next decade under Alternative F

Precommercial thinning	Acres winter snowshoe hare habitat
Research	1,450 acres
Genetic tree tests	220 acres
Within 200 feet of administrative sites, dwellings or outbuildings	2,190 acres
Aspen	3,050 acres
Whitebark pine	9,110 acres
Subtotal	*16,020 acres*
Daylight thinning where 80% of the cover is retained	
Planted western white pine	51,090 acres*
Total	67,110 acres

* 20% snowshoe hare forage may be reduced on day light thinning acres. 20% of 51,090 = 10,200 acres + 16,020 acres traditional thinning = 26,240 acres where snowshoe hare forage may be reduced.

snowshoe hare habitat – see Table 3-15 and the discussion in the summary of effects for Alternative F.

Other vegetation management projects under Alternative F in multistoried forests, Alternative F would preclude most vegetation management except fuel treatment projects in the WUI. Projects adjacent to homes or for research could occur. In addition, removal of a minor amount of small trees would be allowed within skid trails for salvage operations. Salvage operations are allowed because these operations remove larger trees which do not have tree limbs that come to snow level; therefore, they do not provide winter snowshoe hare habitat.

Vegetation management projects could occur if it improved or maintained foraging habitat in the long term. Small openings could be created or mid-height trees removed so small trees and brush could grow. How many acres might be involved depends on the number and size of site-specific projects

Table 3-15. Hare forage affected under Alternative F in a decade with full funding - Montana

	High density young 894,000 ac	High density multistory 1,475,000 ac	Total high density 2,369,000 ac	Low density young 744,000 ac	Low density multistory 1,010,100 ac	Total low density 1,754,000 ac
Precommercial thinning (acres)	20,500	0	20,500	0	0	0
Fuel treatment (acres)	0	24,400	24,400	0	21,800	21,800
Whitebark pine restoration (acres)	40,000	0	40,000	0	0	0
No treatment (acres)	833,500	1,720,600	2,284,100	744,000	988,200	1,732,200
Percent winter snowshoe hare habitat treated	7%[1]	2%[2]	4%[3]	0%[4]	2%[5]	1%[6]
Timber harvest	No effect	Likely minor – some detrimental, some beneficial	Likely minor – some detrimental, some beneficial	No effect	Likely minor – some detrimental, some beneficial	Likely minor – some detrimental, some beneficial
Grazing	No effect	No effect	No effect	No effect	No effect	No effect

[1] 20,500 + 0+ 40,000 / 894,000 = 7%
[2] 0 + 24,400 + 0/ 1,475,000 = 2%
[3] 20,500 + 24,400 + 40,000 / 2,369,000 = 4%
[4] 0 + 0+ 0 / 744,000 =0%
[5] 21,800 / 1,010,000 =2%
[6] 0 + 21,800 + 0 /1,754,000 =1%

Assumptions

Whitebark pine restoration would occur only in high-density winter snowshoe hare habitat.

No restrictions on fuel treatments with the WUI; Fuel treatments outside the WUI would be precluded (Appendix M)

Other information

About 20,550 of the 67,100 of the acres of precommercial thinning scheduled in lynx habitat are in Montana (Appendix K, Table K2)

Grazing under Alternative F
Grazing standards are replaced by guidelines under Alternative F. If the guideline is not followed in some areas then potential snowshoe hare habitat could be reduced, which may affect an individual lynx. However, there is no information that grazing poses a threat to lynx populations (Appendix P); therefore the effects would only be localized and would not affect the population as a whole.

Summary of effects on foraging habitat under Alternative F
Precommercial thinning on 20,500 acres in Montana would be allowed under Alternative F which would affect about 2 percent of high density young forests. Another 5 percent of high density young forests could be affected by restoring whitebark pine through thinning then prescribed burning.

In Montana, about 131,000 acres of fuel treatment is projected to occur in winter snowshoe hare habitat if there are no constraints. In Alternative F fuel treatments would not be preclude in the WUI which amounts to about 46,000 acres. About 2 percent of the high density and 2 percent of low density multistoried winter snowshoe hare habitat could be reduced due to fuel treatments.

Most other activities in multistoried forests would be precluded. These activities would have little to no effect the overall amount of winter snowshoe hare habitat. In addition, some projects could be designed to enhance multistoried conditions.

Denning habitat

Denning habitat consists of the woody debris in which lynx make their dens—root wads, wind-thrown piles, or large down trees. Lynx productivity may be affected by the availability of denning habitat. It is used for birthing and rearing kittens. The debris protects the kittens from predators and from weather.

For denning habitat to be useful to lynx, it generally needs to be in or near foraging habitat. Because kittens are not very mobile early on, and the mother has to hunt to feed herself and her kittens, the juxtaposition of denning and foraging habitat is especially important.

Where denning habitat occurs

Den sites were found in the Yukon, in burned areas where woody debris was available (Slough 1999). Studies in the Seeley Lake area in northwest Montana are not complete, but preliminary results indicate most dens are under a deadfall of mature trees (J. Squires, pers. com. Oct 30, 2006). These sites may be in mature forests or under younger forest stands with a dead and down residual component of large trees. Smaller logs are also sometimes used for dens when they occur in "jack-strawed" condition (J. Squires, pers. com. Oct 30, 2006). Results in northwest Montana show lynx use a variety of conditions for den sites, including down logs (59 percent), rootwads with logs (22 percent), rocks and boulders with logs (11 percent), slash (11 percent), and under live trees (2 percent). Lynx mostly used mature forests (73 percent) for denning, but also used young regenerating forests (18 percent).

The important component for all lynx den sites appears to be the amount of down woody debris present, not the age of the forest (Mowat et al. 2000, Appendix P).

No quantitative assessment is available of the amount and distribution of woody material in the planning area. Denning habitat would be evaluated based on site-specific information available at the project level. However, based on additional studies completed or in progress since the DEIS, it appears that denning habitat is not a limiting factor because lynx use a variety of sites for denning and these habitat elements are generally found in most areas (J. Squires, pers. com. 2006)

In addition, the BA on existing plans found that generally denning habitat is likely not a limiting factor in the planning area because most existing plans include direction to provide for old growth or retain dead and down material (Hickenbottom et al. 1999). Plans for the Ashley and Deerlodge include no such direction.

Denning habitat risks

Risks to denning habitat include logging and fire. Prescribed fires and timber harvest remove woody material and may affect what is available. Salvage logging in particular removes denning habitat and potential denning habitat because it removes dead and down trees. If some areas of down woody debris or areas of dead trees are not retained then denning habitat may become limiting, especially if pockets of large woody debris are not available elsewhere in an LAU.

Denning habitat under Alternative A, no action

Most existing plans contain provisions to retain dead-and-down woody material or to maintain old growth habitat, which the BA deemed adequate to meet lynx denning needs (Hickenbottom et al. 1999) – see Table 3-16.

For those units whose plans contain either very limited, incidental, or no direction, denning habitat could be reduced under Alternative A, so successful reproduction and kitten survival could be affected.

Under the no-action alternative, management direction to conserve lynx would not be incorporated into existing plans. Adequate denning habitat may be available on units with old growth or dead and down direction, and may not be available where such direction is lacking.

Denning habitat under Alternative B

Alternative B would add management direction to provide denning habitat.

- Objective VEG O2 says foraging habitat should be next to denning habitat
- Standards VEG S3 and VEG S4 are discussed below
- Guidelines VEG G2, VEG G3, and HU G1 emphasize locating foraging habitat near denning habitat, retaining denning habitat where it is unlikely to be consumed by stand-replacing fire

Table 3-16. BA findings about whether existing plans provide for denning habitat

	Fully or substantially	Marginally	Does not	Unknown or n/a
Twenty plans	80%	10%	10%	0%

and retaining woody debris when developing or expanding ski areas.

Standard VEG S3 requires ten percent denning habitat be provided in each LAU on lands capable of producing it, which would be beneficial for lynx.

Standard VEG S4 allows salvage logging in disturbed areas five acres or smaller only where public safety is at risk, such as in recreation sites or road or trail corridors. The area involved is likely to be small, and since the BA said denning habitat is probably not limiting in most of the planning area, the effect on lynx of allowing this logging is likely negligible.

For plans lacking it, Alternative B would add management direction to provide for denning habitat, increasing the likelihood that denning habitat would be available and distributed across all LAUs in the planning area, which would be beneficial to lynx.

Denning habitat under Alternative C

Like Alternative B, Alternative C would add management direction increasing the likelihood that denning habitat would be provided and distributed in lynx habitat across all LAUs in the planning area. This would be beneficial to lynx.

Alternative C differs from Alternative B in that Standard VEG S4 in Alternative C allows for salvage logging within 200 feet of dwellings, as well as for public safety. Again, because the area involved is small and close to human habitation, the effect on lynx is likely negligible.

Denning habitat under Alternatives D & E

Alternatives D and E modify Standard VEG S3 to say where ten percent denning habitat is not present, projects should avoid reducing it, or if they do reduce it, the effects would be mitigated. Mitigation may involve retaining standing dead trees and coarse woody debris to provide future denning sites, which would be beneficial to lynx.

Alternatives D and E would also add management direction increasing the likelihood that denning habitat would be provided and distributed in lynx habitat across all LAUs in the planning area, which would be beneficial to lynx. However, Standard VEG S4 is changed to Guideline VEG G7 in these two alternatives, so retaining dead trees in disturbed areas of five acres or smaller is no longer mandated, but would need to be considered.

These alternatives may result in some loss of denning habitat compared to Alternatives B and C, because the standard restricting salvage harvest is changed to a guideline.

Denning habitat under Alternative F

Alternative F consolidates all the denning management direction in Alternative B (Standards VEG S3, and VEG S4, Guidelines VEG G2 and VEG G3) into one guideline VEG G11.

The requirement to retain ten percent denning habitat was not included because (1) den sites are located in areas that have pockets of large amounts of woody debris - not every acre needs these piles - but they should be available across the LAU; and (2) if mature and old forests were used as a proxy to determine the amount of denning habitat there would be an abundance of denning habitat in most

LAUs. (See discussion in *Chapter 2, management direction considered.*) In addition, denning habitat can be found in young regenerating forests; therefore it is more important that an LAU have pockets of large woody debris versus ten percent denning habitat.

Guideline VEG G11 says denning habitat should be distributed in each LAU and if denning habitat appears to be lacking then projects should be designed to retain some coarse woody debris, piles or residual trees to provide denning habitat in the

Although specific standards and guidelines associated with salvage harvest are not included in Alternative F, salvage harvest projects would be required to evaluate whether or not there is denning habitat across an LAU and if not the project would be designed to leave some piles of large woody debris, or areas of dead trees; therefore Alternative F would result in long-term beneficial effects because it ensures denning habitat is provided.

Competition from other predators

Lynx have very large feet in relation to their body mass, providing them a competitive advantage over other carnivores in deep snow. Snow compaction may allow *competing carnivores* - primarily coyotes but also mountain lions and bobcats - winter access along compacted routes into lynx habitat, where they can hunt.

Where & how competition occurs

Snow conditions vary, both seasonally and from year to year. Periods of warm and windy weather may result in hardened snow. How long the crusted snow lasts depends on location, aspect, slope, and snowfall and temperature changes. Heavy snowfalls are frequent in the northern Rockies. Compacted snow may exist regularly only where people repeatedly compact it throughout the winter.

Various reports and observations have documented coyotes using high elevation areas with deep snow (Buskirk et al. 2000a). Coyotes use open areas because the snow is more compacted there, according to research conducted in central Alberta (Todd et al. 1981). Another study in Alberta showed coyotes selected hard or shallow snow more than lynx (Murray et al. 1994). A study in eastern Canada showed much less snowshoe hare activity within 240 feet of repeatedly used snowmobile trails, with much more red fox activity (Neuman & Meriam 1972).

Within lynx habitat in northwestern Montana, twelve radio-collared coyotes were monitored over three winter seasons to assess how coyotes interacted with compacted snowmobile trails (Kolbe et al. in press). Coyotes remained in lynx habitat having deep snow conditions and traveled on compacted snowmobile trails more than expected by random chance. However, coyotes used compacted snowmobile trails for less than eight percent of their travel and used compacted and uncompacted roads similarly (Kolbe et. al. in press). Coyotes did strongly select for shallower and more supportive snow surfaces when traveling off of compacted trails. In this study coyotes primarily scavenged ungulate

carrion that was readily available while snowshoe hare kills comprised only three percent of coyote feeding sites (Kolbe et al. in press).

In the Uinta Mountains of northeastern Utah and three comparative study areas (Bear River range in Utah and Idaho, Targhee NF in Idaho, Bighorn NF in Wyoming) Bunnell (2006) found the presence of snowmobile trails was a highly significant predictor of coyote activity in deep snow areas.

From track surveys it was determined that the vast majority of coyotes (90 percent) stayed within 350 meters of a compacted trail and that snow depth and prey density estimates (snowshoe hares and red squirrels) were the most significant variable in determining whether a coyote returned to a snowmobile trail (Bunnell et al. 2006). Of the four study areas recent lynx presence has only been documented on the Targhee NF.

Based on these new research results there still is no conclusive evidence that, if competition exists between lynx and other predators, it exerts a population level threat on lynx (Appendix P, p. 40097).

How competition may be affected by management activities

Competition risks from winter over-the-snow recreation

Winter recreation such as snowmobiling, cross-country skiing, dog-sledding, and snow-shoeing compacts snow throughout the winter in some places, potentially increasing the access other predators have into lynx habitat (Halfpenney et al. 1999). These activities are increasing in lynx habitat - see the *Recreation* section later in Chapter 3.

About 13,000 miles of designated and groomed snowmobile and cross-country ski routes are in the planning area. Of these, about 8,000 miles are in lynx habitat. In the planning area, there are 359 special use permits and agreements for winter activities, 94 percent in lynx habitat. These activities compact the snow and may provide access for competing predators to areas with deep snow.

Competition risks from mineral & energy development

Mining and energy development may change or eliminate lynx habitat, and can promote winter access—see the *Minerals* section later in Chapter 3. Access roads may be plowed during winter, improving access for competing predators into lynx habitat. These effects are likely to be localized since there is no information to indicate that mining or energy development poses a threat to lynx populations as a whole (Appendices O and P).

Mineral materials (gravel, rock, sand)

About 2,600 active mineral materials pits exist in the planning area. Of these, between two to three percent (from 50 to 80) are in lynx habitat. Pit size ranges from less than one acre up to five acres. Currently, only one has winter operations.

Locatable minerals (gold, silver, copper, etc.)

In the year 2000, 142 Plans of Operations and 550 Notices of Intent to operate were processed for the planning area. During the last 15 years, about a third were inside lynx habitat. Most existing locatable minerals operations are less than 20 acres,

although there are five operations in lynx habitat that are from 100 to 600 acres. The potential for mineral discovery in lynx habitat is considered low.

Leasable minerals

There are about 820,000 acres under lease for oil and gas, with more acres pending for lease in the planning area. Only four wells have been drilled in lynx habitat during the past decade. Only one is still active. Recent estimates suggest that thirty-three more wells may be drilled. Currently, there are no pipelines in lynx habitat.

Competition risks from forest roads
Forest and backcountry roads and trails may make snow-compacting activities easier, which in turn may provide competing predators access into lynx habitat during the winter (LCAS). See the *Roads* section later in Chapter 3.

Competition under Alternative A, no action

The BA on existing plans (Hickenbottom et al. 1999) found most existing plans contain limited direction about snow-compacting activities – see Table 3-17. Under the no-action alternative, management direction to conserve lynx would not be incorporated into existing plans. Existing land management direction would continue to be implemented.

Winter recreation under Alternative A
Existing management direction for over-the-snow winter recreation would continue. Grooming winter trails is likely to remain stable at current levels for at least the next five years because the amount of money for grooming is not likely to increase substantially. However, grooming may increase later in the decade to meet the continuing increase in demand, if funding becomes available.

Public demand for outfitter services is likely to increase, and outfitter growth would likely follow current business trends. Outfitters have been diversifying their businesses by shifting their services to winter recreation, although the number of outfitters has remained stable during the last decade.

Existing uses may provide packed trails for other carnivores to more easily enter lynx habitat, and compete with lynx for food or prey on lynx. Under existing plans, grooming and designated routes could expand into new areas, providing additional access.

Mineral & energy development under Alternative A
There is limited mineral and energy development in lynx habitat. Access roads that are plowed in winter could also improve the access for competing predators.

Forest roads under Alternative A
About ten miles of road construction could occur in lynx habitat during the next few years – see Table 3-18 next page.

Table 3-17. BA findings about whether existing plans manage snow-compacting activities

	Fully or substantially	Marginally	Does not	Unknown or n/a
Winter recreation	15%	40%	40%	5%
Minerals	20%	55%	20%	- - -
Forest roads	60%	15%	25%	- - -

About five miles could be located on ridge-tops where lynx may travel. New road construction may provide new areas for over-the-snow winter recreation and may provide improved access to competing predators.

Competition under Alternative B

Alternative B would minimize potential risks to lynx from competing predators – see Table 2-1 in Chapter 2 for the complete text of the alternatives.

Objective HU O1 would discourage new snow-compacting activities in lynx habitat.

- Standard HU S1 would limit increases in designated routes in an LAU.
- Standard HU S3 would restrict winter motorized access to designated routes for some activities.
- Guidelines HU G4, HU G5, and HU G9 would encourage remote monitoring reclaiming sites, restricting access, and decommissioning new roads.

Winter recreation under Alternative B

Standard HU S1 says new routes could not be designated in an LAU, unless the designation would consolidate use and improve lynx habitat. Grooming could expand onto routes that are currently designated but not groomed. No restrictions are imposed for off-trail use.

Alternative B would limit the amount of human-caused snow compaction occurring in new areas. Standard HU S1 would limit the potential competition from other carnivores to existing areas.

Mineral & energy development under Alternative B

Standard HU S3 would restrict winter access for mineral and energy development to designated routes to help reduce snow compaction. Designating routes could benefit lynx by reducing the access competing predators have into lynx habitat.

Forest roads under Alternative B

Alternative B would provide guidance about what to consider during road construction to minimize or reduce the effects on lynx. Public access could be restricted on new roads, and new roads generally should not be built on ridge-tops.

Competition under Alternatives C & D

Alternatives C and D are similar to Alternative B for minerals and forest roads.

Winter recreation under Alternatives C and D

Standard HU S1 would increase the size of the area used to evaluate changes to groomed and designated routes, from a single LAU, to an LAU or a fixed combination of adjacent LAUs. Standard HU S1 would allow groomed and designated routes to expand into areas that are already consistently used and compacted, as identified in the baseline of areas and routes used between 1998 and 2000.

Table 3-18. Forest road management plans in lynx habitat in the planning area

Category of road	Miles
Road construction planned during the next *five years* that could remain open	10
Roads planned on ridge tops that could remain open during the next *decade*	5

Many existing snowmobile and cross-country ski routes traverse multiple LAUs. Managing larger route systems could consolidate use and provide a more effective way to reduce or eliminate effects beneficial effect on lynx populations as a whole. However, individual lynx may be affected.

Although expansion would be allowed, routes could expand only into areas already compacted, so there would be no net change in snow compaction in an LAU. This would allow for some expansion of groomed and designated routes, while maintaining the status quo on snow compaction.

Competition under Alternatives E & F

Alternatives E and F are similar to Alternatives C and D for winter recreation.

Mineral & energy development under Alternatives E and F

Alternatives E and F would change the management direction for over-the-snow use and mineral access from standards to guidelines. This change could allow snow compacting activities in new areas potentially affecting individual lynx that use these sites. However, these effects are likely to be localized since there is no information to indicate that over-the-snow compaction poses a threat to lynx populations as a whole (Appendices O and P).

Mortality risk factors

Mortality risks were the second major category of risks to lynx identified in the LCAS. A *mortality risk* is something that increases the likelihood lynx will be killed.

Direct mortality can be caused by:
- Vehicle collisions on highways
- Predation by other species
- Predator control activities
- Shooting
- Trapping

Most mortality is caused indirectly by starvation from lack of prey, as discussed previously.

Vehicle collisions on highways

Major high-use highways such as I-90, I-15, US-2, US-12, and US-93 may result in lynx deaths from vehicle collisions (LCAS). The effects of highways on lynx are discussed with movement risks beginning on the next page.

Predation by other species

Predation on lynx kittens by coyotes, grey wolves, mountain lions, bobcats, and birds of prey has been inferred or documented throughout the range of the lynx (LCAS).

Snow compacted by snowmobiling, skiing, etc., may facilitate the movement of other predators into lynx habitat (Buskirk et al. 2000a). The effects of snow compaction on lynx were previously discussed with competition risks.

Predator control, shooting & trapping

The USDA Wildlife Services traps, shoots and poisons predators on federal lands, usually on domestic livestock allotments and sometimes inside lynx habitat. While these efforts are directed at specific species or offending animals, occasionally a lynx may be affected. Wildlife Services captured and released a lynx in Idaho in 1991 but there have been no other recent reports (LCAS). People on adjacent private lands may conduct similar efforts.

Lynx trapping is not permitted in any of the states in the planning area; however, lynx may be trapped incidentally. Lynx could be shot mistakenly by legal hunters or illegally by poachers.

This proposal does not address predator control, shooting, or trapping because they are outside the jurisdiction of the FS. For more discussion, see the Chapter 2 section, *Management direction considered.*

Movement risk factors

Risks to lynx movement were the third major category of lynx risk factors identified in the LCAS. A *movement risk* is anything that increases the likelihood lynx movements will be impeded or inhibited.

Lynx travel varies from 1.6 miles up to six miles per day. Lynx are known to regularly explore from nine to 25 miles beyond their home ranges, and to make long-distance moves of up to 600 miles when prey is scarce (LCAS).

Recent genetic work has shown that lynx throughout western North America are closely related (Schwartz et al. 2002), indicating populations have been well enough connected to maintain close kinship. Lynx seem to prefer to move through continuous forest, frequently use ridges, saddles and riparian areas (Koehler 1990, Staples 1995) and have been observed to avoid large openings (Ruggerio et al. 2000a).

At this time no natural or human-caused barriers that effectively prohibit movement of lynx between Canada and the northern Rockies have been identified (Appendix P, p. 40097).

The riparian corridors required by INFISH and PACFISH provide connectivity by making continuous forest or shrub cover available (Hickenbottom et al. 1999). INFISH and PACFISH apply to planning area NFs west of the Continental Divide.

As part of the Conservation Agreement, the agencies agreed to identify linkage areas. *Linkage areas* are places that connect blocks of lynx habitat, and have been identified for Idaho, Montana, Wyoming and Utah. Federal, state, and tribal governments—including highway agencies—were involved. Figure 1-1 identifies linkage areas in the planning area; Appendix B documents the criteria used.

Movement risks

Movement risks from grazing
Livestock grazing may change, reduce, or eliminate snowshoe hare habitat in quaking aspen, willows, and riparian areas. In shrub-steppe habitat, grazing may change plant composition where shrubs provide cover and connectivity between blocks of lynx habitat. These effects are likely to be localized since there is no evidence grazing poses a threat to lynx populations as a whole (Appendix P).

Movement risks from highways
Highways can alter landscapes by fragmenting large tracts of land. The degree of impact increases as highways are upgraded from two lanes. However, no information exists to determine the level that traffic volume or roadway design affects lynx (Appendix P).

Major high-use highways such as I-15, US-55, US-12, US-95, and state highways 75 in Idaho and 83 in Montana, and US-14, US-26 and US-189 in Wyoming, and I-90 in Utah may impede lynx movement across the landscape (LCAS). While the FS does not have authority over these highways, the agency can influence the consideration of wildlife crossings if a right-of-way is involved.

Most state transportation departments are considering ways to provide wildlife crossings during highway construction and reconstruction projects (Wyoming Dept of Transportation 2005; Idaho Dept. of Transportation 2004; and Montana Dept of Transportation, FHWA, Confederated Kootenai and Salish Tribes 2006).

Parts of US-95 in Idaho and US-2 and US-93 in Montana were rebuilt in the last decade; none of the work was done where lynx linkage areas have been identified.

Movement risks from forest roads
As the standard of road increases from gravel to two-lane highway, traffic speeds and volume increase and can affect lynx movements. During the last decade, about 15 miles of two-lane roads were paved in the amendment area. There is no evidence that lynx avoid or are displaced by unpaved roads; therefore unpaved roads are not considered a threat to lynx movement (Appendix P).

In 2001, the FS established a detailed Roads Analysis policy (36 CFR 212.5(2)) to decide which roads to keep and which to decommission. Before any road is upgraded, a Roads Analysis must be completed. Lynx needs would be considered as part of this analysis.

Movement risks from land ownership patterns
Private land development, especially four season resorts and developments along road corridors in mountain valleys, may fragment habitat and impede lynx movement (LCAS).

Movement risks from recreation
Winter developed recreation
Downhill and cross-country ski areas represent only a small fraction of lynx habitat – less than 30,000 of 18.5 million acres in the planning area – but their location on north facing slopes, high seasonal and year-round use and associated developments may affect lynx movement (LCAS). There are 18 downhill ski areas in lynx habitat in the planning area.

A survey of two ski areas in southern Canada showed that skiers did not seem to keep lynx from occupying and using the areas, and that lynx did not always run away from people (Creel et al. 2002). However, what level of human presence lynx can tolerate has not yet been determined (Roe et al. 2000).

Dispersed recreation
It is unlikely that spring, summer, or fall recreation sites, such as campgrounds, affect lynx because lynx appear to exhibit a low susceptibility to displacement by

Table 3-19. BA findings about whether existing plans manage habitat connectivity

	Fully or substantially	Marginally	Does not	Unknown or n/a
Connectivity	40%	50%	10%	- - -
Coordinating connectivity & land adjustments	20%	60%	20%	- - -
Land adjustments	- - -	50%	50%	- - -
Developed recreation‡	5%	- - -	95%	- - -

humans, even though there is probably some level of activity that would cause lynx to move. Lynx also have more foraging opportunities during these seasons. It is possible lynx could be displaced by activity near denning sites (LCAS). No management direction was developed for spring, summer, or fall recreation because of the low likelihood of conflicts. Therefore, it is not discussed further.

Movement risks under Alternative A, no action

The BA on existing plans (Hickenbottom et al. 1999) found most existing plans contain limited direction about habitat connectivity (Table 3-19). Under the no-action alternative, management direction for the conservation of lynx would not be incorporated into existing plans. The existing direction would continue.

Highways under Alternative A
Two highways in linkage areas could be expanded from two to four lanes during the next decade – US-95 in Idaho and US-30 in Wyoming. Wildlife crossings are being considered for these upgrades even though existing plans do not require them.

Roads under Alternative A
About 45 miles of two-lane roads on NF lands are planned for paving during the next decade – see Table 3-20. Existing plans contain no requirements to consider wildlife crossings, but a Roads Analysis would have to be done to consider resource needs before upgrading. If wildlife crossings are not incorporated, lynx movement could be negatively affected by increasing the speed and traffic volumes on these roads. About 240 miles of road are planned for upgrading. Upgrading could increase traffic speeds and volumes, although not to the same degree as paving.

Land ownership under Alternative A
Existing plans require considering the effects on threatened and endangered species in land ownership adjustments.

About 375,000 acres may be considered for acquisition in the planning area during the next decade. Many acres are in lynx habitat or linkage areas. Acquiring these lands would improve federal landownership patterns.

It is also possible that when acquiring desirable lands, some lynx habitat or linkage areas could be disposed of, which could negatively affect lynx habitat connectivity in some situations.

Winter developed recreation under Alternative A
Twelve downhill ski areas have expansions planned during the next decade. One new ski area is being considered. Potential developments and expansions could result in losing habitat. Habitat fragmentation may increase and could impede the movement of lynx across the landscape.

Table 3-20. Forest road management plans in lynx habitat

Category of road	Miles
Two or more lanes, planned to be paved during the next *decade*	45
Roads planned to be upgraded during the next *five years*	240

Movement risks - Alternatives B, C, D, E & F

Grazing

Standard LINK S2 says to manage livestock grazing in shrub steppe habitat to provide cover and connectivity between blocks of lynx habitat.

Under Alternatives E and F, standard LINK S2 is changed to a less restrictive guideline LINK G2. This change could result in some local reduction of cover and connectivity and may affect an individual lynx that is moving between blocks of lynx habitat. However, there is no evidence that grazing affects lynx populations as a whole (Appendix P). The effect of this change would most likely be felt on the east side of the northern Rockies. This is due to the fact that the INFISH and PACFISH amendments that require protection of riparian areas, which lynx use for travel, already apply west of the continental divide.

Roads and highways

- Objectives ALL O1, HU O6 and LINK O1 describe project design that considers how to maintain and provide for connectivity
- Standards ALL S1, LINK S1 are discussed below. Guideline ALL G1 requires project planners to consider using techniques to avoid or reduce adverse effects on lynx during highway construction and reconstruction
- Under Alternative B, Guideline HU G6 discourages upgrading roads in lynx habitat where the result would be increased traffic volumes or speeds
- Under Alternatives C, D, E and F, Guideline HU G6 says mitigation to maintain lynx movement corridors should be considered when upgrades result in increased traffic volumes or speeds

Currently, wildlife needs are frequently considered in road and highway development. Adding Guidelines ALL G1 and HU G6 to existing plans would make sure they were considered.

Standards ALL S1 and LINK S1 should reduce the effects of habitat fragmentation from roads and highways, and provide for the movement and dispersal of lynx throughout the planning area.

Land ownership

- Objective LINK O1 encourages the FS to work with other landowners to find ways to reduce the potential for adverse effects in linkage areas
- Guideline LINK G1 encourages the FS to retain habitat in linkage areas

Alternatives B, C, D, E, and F should reduce habitat fragmentation from private land development and patterns of scattered land ownership, and enable lynx to move and disperse throughout the amendment area.

Winter developed recreation

- Objectives ALL O1, HU O2, HU O3 and HU O4 encourage maintaining or restoring lynx connectivity
- Standard ALL S1 requires new or expanded permanent developments to maintain connectivity

Under Alternative B, Standard HU S2 requires lynx diurnal security habitat to be provided where needed, although it is not found lacking everywhere. Under

Alternatives C, D, E, and F this direction is changed to a guideline.

- Guidelines HU G2 and HU G3 say lynx movement must be considered when designing developed recreation sites

These objectives, standard, and guidelines do not prohibit new developments or prohibit expanding existing developments. However, they do require considering lynx needs in facility design and operations. As a result, habitat connectivity would be provided in new or expanded operations, and lynx would more likely be able to use these areas and move unimpeded throughout the landscape under Alternatives B, C, D, E, and F.

Standard ALL S2

Alternative D

Alternative D contains Standard ALL S2 that would allow a project to deviate from one or more lynx standards if a determination of "not likely to adversely affect" lynx has been made, subject both to ESA requirements and to approval by the Regional Forester – see Table 2-1. The use of the standard would be monitored.

The 2000 BO says,

> *... for most agency actions, noncompliance with the standards in the LCAS increases the likelihood that actions would adversely affect lynx.*

Possible effects include:

- Some projects may result in improving or maintaining winter snowshoe hare habitat over the long term
- Mandatory standards might not be implemented as intended, or standards might be applied less consistently throughout the planning area because of the many administrative jurisdictions
- Standard ALL S2 provides a less reliable regulatory mechanism because of the uncertainty of its application
- It may be more difficult to determine cumulative effects at the project level for larger scales such as meta - populations

Alternative E

Alternative E also contains Standard ALL S2. Under Alternative E, Standard ALL S2 would allow a project to deviate from one or more lynx standards if the project has short-term adverse effects on lynx, as long as it has long-term benefits to lynx and its habitat, subject to ESA requirements but without a higher level of review. The use of the standard would be monitored, as with Alternative D.

The possible effects are similar to those described under Alternative D, plus:

- Projects would have adverse effects on lynx and require formal consultation with FWS
- Given the current state of knowledge, it may be difficult to determine where, when, and how short-term adverse effects could be offset by long-term improvements in lynx habitat, both inside an LAU and over larger scales
- Short-term adverse effects on individual lynx could occur, because projects with short-term adverse effects could be concentrated in one LAU and combined with projects with long-term benefits in other LAUs
- The lack of higher-level review may lead to a greater degree of inconsistency in how standards are applied

Effects Summary

Table 3-21 summarizes how the alternatives address lynx risk factors.

Alternative A

There would be no change in management direction under Alternative A. Consequently, there would be no change in effects from those identified in the BA for existing plans (Hickenbottom et al. 1999).

Alternative A would not constrain vegetation management activities. Some activities may affect the quantity and quality of lynx habitat over time – see Table 3-22.

Table 3–21. How the alternatives address risk factors

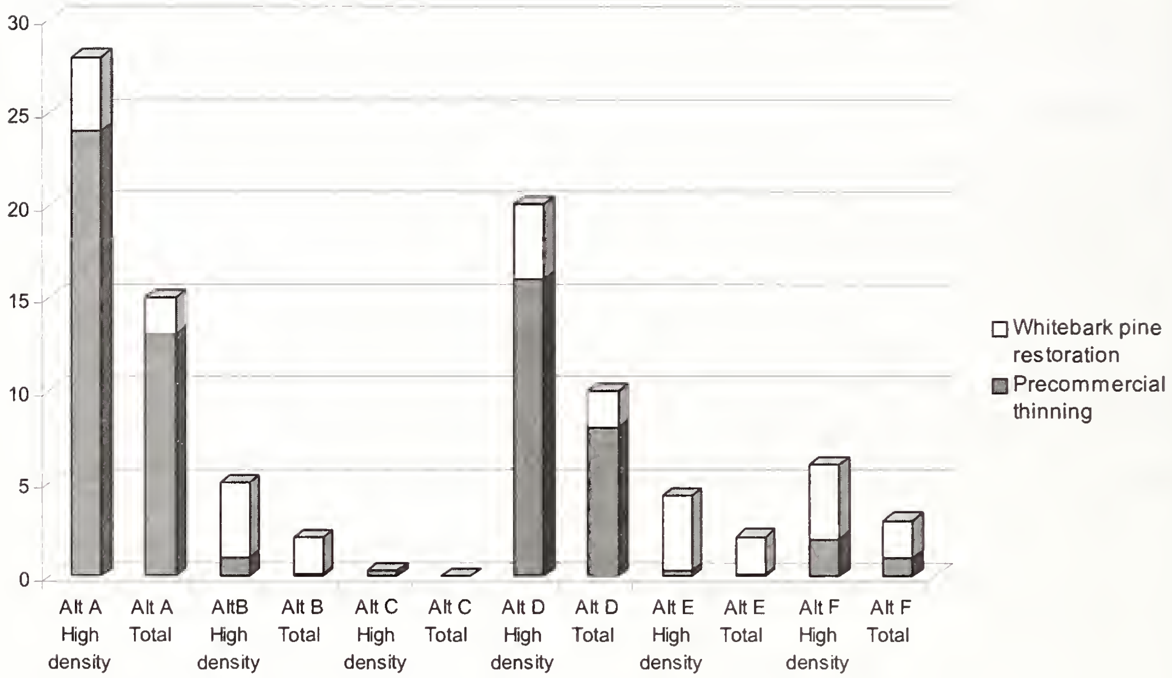
	Alt A	Alt B	Alt C	Alt D	Alt E	Alt F
Incorporates regulatory mechanisms	N	Y	Y	P	P	P
Risk factors relating to quantity and quality of winter snowshoe hare habitat						
Direction limits amount of habitat in a stand initiation structure stage	N	Y	P	P	P	P
Direction limits timber harvest creating stand initiation structure stage	N	Y	P	N	N	P
Direction limits PCT in winter snowshoe hare habitat	N	Y	Y	P	P	P
Direction limits other vegetation projects in multi-story forest that provide winter snowshoe hare habitat	N	N	Y	P	P	P
Direction for fire	N	Y	Y	Y	Y	Y
Direction addresses grazing	P	Y	Y	Y	P	P
Risk factors relating to quantity and quality of denning habitat						
Direction for providing denning habitat	P	Y	Y	Y	Y	Y
Direction retains ten percent denning habitat	P	Y	Y	Y	P	N
Direction defers management activities in potential denning habitat	N	Y	Y	P	P	P
Direction limits salvage of small areas of dead/dying trees	N	Y	Y	P	P	P
Risk factors relating to competition from predators						
Direction for over-the-snow winter recreation	N	Y	P	P	P	P
Direction for ski areas	N	Y	Y	Y	Y	Y
Direction for minerals and energy development	N	Y	Y	Y	Y	Y
Direction for roads	P	Y	Y	Y	Y	Y
Risk factors relating to movement & connectivity						
Direction for highways	N	Y	Y	Y	Y	Y
Direction for land acquisition	N	Y	Y	Y	Y	Y
Direction for connectivity	P	Y	Y	Y	Y	Y

N = No management direction or only very limited direction included

P = Partial, some management direction exists or would be included to limit or avoid some effects caused by the risk factor. Direction may include some exceptions or be in the form of a guideline

Y = Yes, includes enough management direction to limit or avoid effects caused by the risk factor

Figure 3-5a. Percent of winter snowshoe hare habitat in young regenerating forests affected by major activity

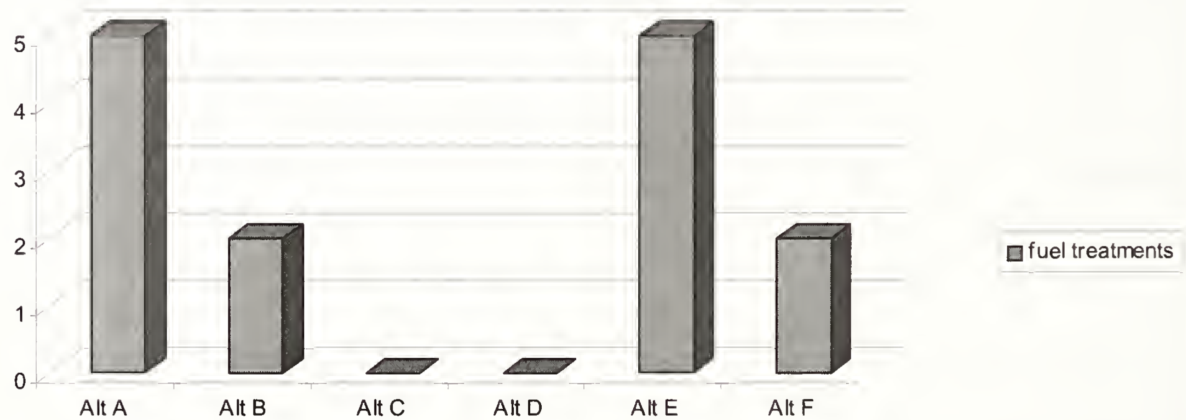


The quantity and quality of winter snowshoe hare foraging habitat would likely decline due to the lack of management direction to:

- Provide a distribution of age classes
- Restrict activities that reduce winter snowshoe hare forage
- Promote actions that create forage where it is lacking

Alternative A could reduce the quantity and quality of high-density winter snowshoe hare habitat in young

Figure 3-5b. Percent of winter snowshoe hare habitat in multistoried forests affected by fuel treatments



regenerating forests by 28 percent during the next decade. The reduction would be the result of precommercial thinning and whitebark pine restoration - see Figure 3-5a.

In addition, Alternative A could reduce the quantity and quality of winter snowshoe hare habitat in multistoried forests by 5 percent during the next decade. The reduction would be the result of fuel treatments - see Figure 3.5b

An adequate amount of denning habitat may not be provided on those units that lack management direction to provide old growth or coarse woody debris. Denning habitat would likely be reduced in some places.

Existing plans would allow snow compacting activities to occur in new places, expanding the area where competition with other predators may occur. This expansion could affect individual lynx; however there is no evidence that if competition exists between lynx and competitors that it affects lynx at a population level (Appendix P).

Lynx movement may be restricted due to lack of management direction to provide habitat connectivity. No direction would be provided for:

- Managing roads, highways, and development, or
- Managing grazing to provide cover, such as in riparian areas

Those plans already amended by PACFISH and INFISH would provide for lynx movement to some degree. Grazing in areas where plans have not been amended by PACFISH and INFISH may affect lynx in local areas by reducing habitat cover but there is no evidence that grazing poses a threat to lynx populations as a whole.

In summary, since specific management direction that address threats to lynx populations (specifically direction for timber harvest, thinning and fire suppression) is lacking in existing plans, adverse effects on lynx populations would continue. The plans also lack direction in some areas for grazing, minerals, roads and over-the-snow use; however, these specific risks are likely to only affect individual lynx, not populations as a whole.

Alternative B

Alternative B would incorporate management direction into existing plans to reduce or eliminate most known adverse effects on lynx populations and individuals, and contribute to conserving the species.

Alternative B would result in improved

Table 3-22. Lynx habitat that could be affected by the major vegetative management activities over the next decade by alternative

	Alt A	Alt B	Alt C	Alt D	Alt E	Alt F
Precommercial thinning	395,330	2,190	3,860	236,480	3,860	67,110
Fuel treatment (unconstrained)	881,000	370,000	0	0	881,000	284,000
Whitebark pine restoration	50,000	50,000	0	50,000	50,000	50,000
Total	1,326,330	422,190	3,860	286,480	934,860	401,110

forage habitat for lynx in young regenerating forests. Alternative B would add management direction to:

- Provide a distribution of forest age classes
- Restrict precommercial thinning
- Promote actions that create forage where it is lacking

In young regenerating forests Alternative B would restrict precommercial thinning so only one percent of forage habitat would be reduced. However whitebark pine restoration could still occur, which could result in additional 4 percent reduction—see Figure 3-5a. In multistoried forests Alternative B only restricts precommercial thinning. Fuel treatments could reduce about 2 percent of multistoried habitat condition - see Figure 3-5b.

Alternative B would incorporate management direction for denning habitat that would protect denning habitat and den sites.

Grooming would not be allowed to expand beyond existing designated routes, and designated over-the-snow routes would not be allowed to expand into new areas. Competing predators would be limited to existing compacted areas, until more information about the effects of competitors using compacted trails can be gathered and analyzed. Alternative B would limit the potential effect on individual lynx.

Lynx habitat connectivity would be improved by providing management direction to retain cover adjacent to riparian areas and to coordinate with other landowners.

Alternative B also would add management direction for grazing, minerals, roads, and over-the-snow use which would minimize potential effects of these activities on individual lynx.

In summary, management direction to address threats to lynx populations, specifically direction for timber harvest and thinning, would be incorporated into existing plans, but multistoried foraging habitat still could be reduced.

Alternative C

Alternative C also would incorporate management direction to reduce or eliminate adverse effects on lynx and contribute to conserving the species.

Alternative C would result in improved winter snowshoe hare habitat by adding management direction to:

- Provide a distribution of forest age classes
- Restrict most vegetation management projects in forage habitat
- Promote actions that create forage where it is lacking in young regenerating forests

Less than one percent of winter snowshoe hare habitat in young regenerating and multistoried forests could be reduced during the next decade by the activities allowed by Standards VEG S5 and S6 - see Figures 3-5a and 3-5b.

Alternative C would expand the area to which Standard VEG S1 is applied, to a fixed combination of adjacent LAUs, to better reflect historic disturbance patterns. This may affect individual lynx because every forest age class may not be represented in a single LAU, but also may

result in a long-term beneficial effect on overall populations because it would better reflect historic disturbance patterns.

Changing Standard VEG S2 to a guideline would provide direction to consider the amount of timber harvest that could create unsuitable habitat, even though timber harvest rarely creates an overabundance of unsuitable habitat (Hillis et al. 2003).

Alternative C would incorporate direction for denning habitat that would protect denning habitat and den sites.

Alternative C would incorporate direction for snow compaction. Standard HU S1 also would be applied to multiple LAUs, and would allow grooming and designated routes to expand into places already compacted. Alternative C would not directly result in new places with human-compacted snow.

Alternative C would incorporate direction for habitat connectivity. Alternative C also adds management direction for grazing, minerals, and roads which would minimize potential effects of these activities on individual lynx. The analysis boundary for over-the-snow use would be expanded which could affect some individual lynx.

In summary, Alternative C would add management direction to address threats to lynx populations, specifically direction for timber harvest, fuel treatments, and precommercial thinning. Nearly all the winter snowshoe hare habitat would be protected.

However the analysis size for considering winter snowshoe hare habitat would be expanded, which could affect individual lynx, but may be beneficial for the population as a whole.

Alternative D

Alternative D would incorporate management direction to reduce or eliminate many adverse effects on lynx and contribute to conserving the species.

Alternative D would add direction to distribute forest age classes, but under Standard VEG S1 expands the size of analysis area even more to allow considering historic disturbance patterns. This change could result in adverse effects on individual lynx, but is likely to provide long-term beneficial effects on lynx populations as a whole.

Alternative D could reduce the amount of quality winter snowshoe hare foraging habitat in young regenerating forests compared to Alternatives B and C because Standards VEG S5 and VEG S6 allow more activities in hare habitat.

During the next decade, Alternative D could reduce the amount of quality forage in young regenerating forests by 20 percent as a result of precommercial thinning and whitebark pine restoration – see Figure 3-5a.

Alternative D would constrain fuel treatments and most other vegetation activities in multistoried forests – see Table 3-22 and Figure 3-5b. This would benefit lynx by retaining this habitat component.

Alternative D provides direction to retain denning habitat and adds management direction for habitat connectivity.

Alternative D also adds management direction for grazing, minerals, and roads, which would minimize potential effects of these activities on individual lynx. The analysis boundary for over-the-snow use would be expanded which could affect some individual lynx.

In summary, Alternative D would add management direction to address threats to lynx populations, specifically direction for timber harvest, fuel treatment, and to some degree precommercial thinning. However some adverse effects would be allowed to occur which would adversely affect lynx.

The analysis size for considering winter snowshoe hare habitat would be expanded which could affect individual lynx, but may be beneficial for the population as a whole. The quality and quantity of winter snowshoe hare habitat could be reduced primarily in young regenerating forests.

Alternative E

Alternative E would incorporate management direction to reduce or eliminate many adverse effects on lynx and contribute to conserving the species.

Alternative E would add direction to distribute forest age classes, but under Standard VEG S1 expands the size of analysis area to allow considering historic disturbance patterns. This change could result in adverse effects on individual lynx, but is likely to provide long-term beneficial effects on lynx population.

Alternative E could reduce high-density winter snowshoe hare habitat in young regenerating forests by four to five percent as a result of whitebark pine restoration – see Figure 3-5a.

Additional forage may be reduced in multistoried forests as the direction for maintaining multistoried winter snowshoe hare habitat is a guideline versus a standard. It is likely most fuel treatment projects, if they occur in this component, would change the structure and composition. About 5 percent of multistoried forests could be affected.

Alternative E provides direction to retain denning habitat – but changes Standard VEG S4 to a guideline VEG G7. There may be instances where denning habitat is not provided. Recent research shows lynx use a variety of conditions for dens sites and these habitat elements are generally found across broad landscapes. Therefore the change in management direction – as compared to Alternative B – would not likely affect lynx.

Alternative E would permit short-term adverse effects on lynx, but only if there are long-term beneficial effects.

Alternative E also adds management direction for grazing, minerals, and roads, which would reduce potential effects of these activities on individual lynx. The management direction is changed from standards to guidelines which could affect individual lynx if the guidelines are not followed; however this change would not affect lynx populations since these risks have been determined to not threaten the overall population of lynx.

In summary, Alternative E would add management direction to address threats to lynx populations but would allow some

adverse effects to occur. The analysis size for considering the amount of winter snowshoe hare habitat would be expanded, which could negatively affect individual lynx but may be beneficial for the population as a whole. The quality and quantity of winter snowshoe hare habitat in multistoried forests could be reduced by five percent due to allowing fuel treatments and whitebark pine restoration activities to occur.

Alternative F Scenario 1

Alternative F would incorporate management direction to reduce or eliminate many adverse effects on lynx and contribute to conserving the species. **Alternative F, Scenario 1, would apply the management direction to all lynx habitat in LAUs on all units in the planning area.**

Alternative F would incorporate direction for those forested vegetative structural conditions important to lynx (both young regenerating forests and multistoried forests) at the scale of an LAU. This would ensure blocks of quality habitat are maintained within each LAU. In addition, Alternative F includes Standard VEG S2 which would limit the rate of change in lynx habitat within an LAU. This would ensure sufficient habitat for lynx through time and preclude LAUs being rendered incapable of supporting lynx by an activity or several activities over a short period of time.

Alternative F Scenario 1would allow some reduction in the amount of quality winter snowshoe hare foraging habitat in young regenerating forests because some precommercial thinning would be allowed. During the next decade, Alternative F Scenario 1 could reduce the amount of high density winter snowshoe hare habitat up to two percent as a result of precommercial thinning and an additional five percent doe to whitebark pine restoration – see Figure 3.5a.

Alternative F provides direction for retaining winter snowshoe hare habitat within multistoried forests, in the form of a standard, although some activities would be allowed.

In multistoried forests, Alternative F exempts fuel treatments within the WUI from the vegetation standards. However, Guideline VEG G10 encourages projects to consider the vegetation standards during design, so it is likely many projects would still follow the standards. If all projects do not meet the standards in multistoried forests, then it is projected that up to 2 percent of the forage would be reduced.

In case the situation changes or more funding becomes available, a limitation was incorporated into the vegetation standards. The limitation is as follows: fuel treatment projects within the WUI that do not meet standards may occur on no more than 6 percent (cumulatively) of lynx habitat on a national forest. This cap ensures 94 percent of lynx habitat would have management direction to address risks to lynx.

Alternative F provides direction to retain denning habitat – but combines all denning related standards and guidelines into one guideline. Recent research shows lynx use a variety of conditions for dens sites and these habitat elements are generally found across broad landscapes.

Therefore the change in management direction—as compared to Alternative B—would not likely affect lynx.

Alternative F adds management direction for habitat connectivity, grazing, minerals, and roads, which would minimize potential effects of these activities on individual lynx. The analysis boundary for over-the-snow use would be expanded from a single LAU to an LAU or a fixed combination of adjacent LAUs, which could affect some individual lynx.

In summary, Alternative F Scenario 1 would add management direction to address threats to lynx populations, specifically direction for timber harvest, fuel treatments, and thinning. Some adverse effects would be allowed to occur, but with limitations. The analysis size for considering winter snowshoe hare habitat would be applied at the LAU level ensuring blocks of quality lynx habitat are maintained within each LAU. The total amount of winter snowshoe hare habitat could be reduced by about four percent.

Alternative F Scenario 2

Alternative F, Scenario 2 would incorporate management direction to reduce or eliminate many adverse effects on lynx and contribute to conserving the species. **Alternative F, Scenario 2, would apply the management direction to all *OCCUPIED* lynx habitat (as defined in the *Amendment to the Conservation Agreement* (USDA FS, USDI FWS 2006a) in LAUs on all units in the planning area.**

Lynx habitat on the Beaverhead-Deerlodge, Bitterroot, Nez Perce, Salmon-Challis, Bighorn and Ashley NFs, and the isolated mountain ranges on the Custer, Gallatin, Helena and Lewis and Clark NFs are currently unoccupied; therefore the management direction would not apply to projects or activities in these areas. Management direction would be incorporated into these forest plans and would be "considered" in the design of projects or activities in these areas. If these administrative units and isolated mountain ranges become occupied in the future, then manageme0nt direction would be applied.

The effects for areas which are occupied would be the same as described in Alternative F, Scenario 1. The remainder of this analysis summarizes the effects of Alternative F, Scenario 2, if management direction is not applied to the units described above.

The Beaverhead-Deerlodge, Bitterroot, Nez Perce, and Salmon-Challis NFs and the isolated mountain ranges on the Helena, Gallatin and Lewis and Clark NFs (except the Highwood and Snowy Mountains) have been identified as *secondary* habitat in the FWS Recovery Outline (USDI FWS, 2005a). Secondary areas are those with historical records of lynx but with no record of reproduction; or areas with historical records and no recent surveys to document the presence of lynx and /or reproduction. Only the Nez Perce NF falls into the second category. As of 2006 it had not been surveyed. Surveys are being conducted during the winter of 2006/07 to determine lynx occupancy. Based on the findings of

the survey the Nez Perce would either be identified as occupied or unoccupied.

According to the *Recovery Plan Outline* (USDI, FWS 2005a) habitat in secondary areas may be patchier, drier, and/or more maritime resulting in snow or habitat conditions that are not favorable to lynx. Another explanation may be that lynx populations were extirpated because of changes in vegetation structure that resulted in poor prey populations or some other disturbance, such as past trapping, and the area has not been recolonized by lynx.

The Ashley and Bighorn NFs, and the Pryor Mountains on the Custer NF and the Highwood and Snowy Mountains on the Lewis and Clark NF are considered "peripheral" habitat (USDI FWS 2005a). These areas contain few verified historical or recent records of lynx. Quantity and quality of habitat to support adequate snowshoe hare or lynx populations are questionable. Habitat may occur in small patches and is not well-connected to larger patches of high quality habitat.

Management direction to distribute forest age classes (Standards VEG S1 and VEG S2) would not be applied on these units, until the areas become occupied by lynx.

In FS Region 1, less than 13 percent of the LAUs have more than 30 percent in young regenerating forests that do not yet provide winter snowshoe hare habitat. All were caused by wildfires in 1988 and 2000. About 13 percent had more than 15

Table 3-23. Winter snowshoe hare habitat in young regenerating forests that could be affected by precommercial thinning in "unoccupied" units or isolated mountain ranges over the next decade under Alternative F, Scenario 2

Unit	Acres of lynx habitat	Acres unoccupied	Acres of PCT in lynx habitat full funding	% lynx habitat affected over 10 yrs full funding
Beaverhead Deerlodge	2,060,000	All	21,280	1.0
Bitterroot	640,000	All	510	.08
Nez Perce	810,000	All	12,370	1.5
Salmon-Challis	1,800,000	All	22,000	1.2
Gallatin *	870,000	100,000	26,300	3.0
Helena *	440,000	110,000	3,830	.09
Custer *	230,000	30,000	1,010	.4
Lewis and Clark*	970,000	590,000	7,410	.08
Ashley	700,000	All	7,710	1.1
Bighorn	310,000	All	3,000	1.0

*Data is for only available for the whole forest, so activities in the isolated mountain ranges would be less than indicated in this table

Unoccupied habitat on the Ashley, Bighorn, Custer and 90,000 acres on the Lewis and Clark are considered peripheral habitat. All other areas are considered secondary (USDI FWS 2005a)

percent in young regenerating forests (Hillis et al. 2003); timber harvest caused very few to exceed 15 percent in young regenerating forests that do not yet provide winter snowshoe hare habitat.

In some areas, it is possible for individual lynx - if they were to occur - to be affected because of the distribution of foraging habitat. Where large patches of very young regenerating forests have resulted from fire and timber harvest, these patches likely would become foraging habitat over time. Other places may lack young regenerating forests because they lack disturbance.

Management direction to retain quality winter snowshoe hare habitat (Standards VEG S5 and VEG S6) would not be applied on these units, until the areas become occupied by lynx.

Alternative F, Scenario 2 would allow reduction in the amount winter snowshoe hare habitat in young regenerating forests because units that are unoccupied would not be constrained by the management direction.

Table 3-23 (on the previous page) displays how much precommercial thinning is anticipated over the next decade in the six unoccupied forests. Information specific

Table 3-24. Lynx habitat that could be affected by fuel treatment projects in affected "unoccupied" units or isolated mountain ranges over the next decade under Alternative F, Scenario 2

Unit	Acres of lynx habitat	Acres unoccupied	Acres of fuel treatment next 10 yrs in lynx habitat*	% lynx habitat affected over 10 yrs
Beaverhead Deerlodge	2,060,000	All	49,920	2.4
Bitterroot	640,000	All	21,080	3.3
Nez Perce	810,000	All	32,560	4.0
Salmon-Challis	1,800,000	All	49,500	2.8
Gallatin *	870,000	100,000	19,050	2.2
Helena *	440,000	110,000	31,150	7.1
Custer *	230,000	30,000	21,780	9.5
Lewis and Clark*	970,000	590,000	34,840	3.6
Ashley	700,000	All	132,850	19.0
Bighorn	310,000	All	32,400	10.5

Acres from Appendix M-1 and are based on the assumption that fuel treatments would occur in lynx habitat in proportion to the amount of habitat on the unit (e.g. 110,000 acres of fuel treatment are projected to occur on the Salmon-Challis NF. Since lynx habitat makes up 45% of the forest, then 45% of the fuel treatment program is assumed to occur in lynx habitat)

*Data is for only available for the whole forest, so activities in the isolated mountain ranges would be less than indicated in this table

Unoccupied habitat on the Ashley, Bighorn, Custer and 90,000 acres on the Lewis and Clark are considered peripheral habitat. All other areas are considered secondary (USDI FWS 2005a)

to the activities in the disjunct mountain ranges on the Custer, Gallatin, Helena and Lewis and Clark NFs is not available, but the data for the whole unit is provided. Less than 3 percent of lynx habitat on any unit would be affected over the next ten years if the units received full funding. However, on average, across all units only 34 percent of the desired funding has been received. It is likely that even without management direction some winter snowshoe hare habitat in young regenerating forests on these units would not be affected by precommercial thinning. The agency has never received full funding and it does not appear the funding scenario in the future for precommercial thinning is likely to change.

Alternative F, Scenario 2 would allow reduction in the amount of quality winter snowshoe hare habitat in multistoried forests because units that are unoccupied would not be constrained by the management direction. Fuel treatments projects may occur in multistoried forests that provide winter snowshoe hare habitat. Table 3-24 displays how many acres of fuel treatment projects are anticipated to occur in lynx habitat over the next decade in the six unoccupied forests. Information specific to the activities in the disjunct mountain ranges on the Custer, Gallatin, Helena, and Lewis and Clark is not available, however, the data for the whole unit is provided.

Except for the Ashley, Bighorn, Custer and Helena NFs less than 5 percent of lynx habitat is likely to be affected by fuel treatments over the next ten years. About 10 percent of lynx habitat could be affected on the Bighorn, 20 percent on the Ashley, 10 percent on the Custer and 7 percent on the entire Helena NF. The amount potentially affected is over estimated for the Custer Gallatin, Helena and Lewis and Clark NFs since portions of these units are occupied and the management direction would be applied in those areas.

Over half of the fuel treatments on the Bighorn and Ashley would be in the form of prescribed fire. Some of the prescribed burning would not occur in winter snowshoe hare habitat because no pretreatment – reduction of ladder fuels - is proposed. Generally multistoried forests would be difficult to burn without pretreatment because of the ladder fuels associated with these types of forests. Those areas that do occur in winter snowshoe hare habitat would not support winter snowshoe hare habitat after treatment.

Management direction for denning habitat would not have to be applied to projects on the Beaverhead-Deerlodge, Bitterroot, Nez Perce, Salmon-Challis, Bighorn and Ashley NFs, and the isolated mountain ranges on the Custer, Gallatin, Helena and Lewis and Clark NFs As noted in the discussion of denning habitat, recent research shows lynx use a variety of conditions for den sites and these habitat elements are generally found across broad landscapes; therefore denning habitat is a not limiting factor for lynx. In addition, most of these units include management direction in their existing plans to provide for down woody debris.

Grazing management direction would not be applied to the unoccupied units. However, all units, except the isolated mountain ranges on the Custer, Gallatin, Helena and Lewis and Clark NFs have similar direction as proposed because of INFISH and PACFISH; therefore there would likely be minimal effect from grazing practices.

Management direction for winter over-the-snow recreation would not be added. Over-the-snow recreation could increase on these units. However, grooming winter trails is likely to remain at current levels for at least the next five years because the amount of money available for grooming is not likely to increase substantially.

On these units outfitters could change their services toward winter use; they could groom more trails and increase the number of winter trips. However, because of how permits are processed it is unlikely there would be a substantial increase in winter outfitter use.

Management direction would not have to be applied to six downhill ski areas located on the Beaverhead-Deerlodge, Helena, Lewis and Clark, Salmon-Challis/Bitterroot and Bighorn National Forests. One ski area on the Beaverhead-Deerlodge, one on the Lewis and Clark and one on the Salmon-Challis/Bitterroot have expansions proposed. These ski areas are generally isolated; therefore there would be minimal effect on lynx.

Management direction for highways would not have to be applied. Methods to provide safe wildlife crossings are being researched by all state highway organizations and are being incorporated into highway improvements; therefore lack of this management direction is likely to have minimal effect.

Management direction for forest roads would not have to be applied. On the Nez Perce NF only seven miles are planned to be paved over the next five years. On the Salmon-Challis NF twelve miles are planned for upgrades over the next five years. On the Beaverhead-Deerlodge NF five miles are planned to be paved, 2.4 miles of new roads are planned for construction and may remain open, and 1.5 miles are planned for upgrades over the next five years. On the Bitterroot NF no changes are anticipated. On the Ashley NF about two miles are planned to be paved and an additional two miles are planned for upgrades over the next 5 years.

On the Custer 6.6 miles are planned to be paved and 14 miles planned to be upgraded; on the Helena NF about five miles are planned to be paved and twenty miles are planned for upgrades; and on the Gallatin 8 miles are planned to be paved and five miles are planned to be upgraded; however it is unknown if these actions are in the isolated mountain ranges that are unoccupied by lynx. No roads are planned to paved or upgraded on the Lewis and Clark NF

Management direction would not have to be followed in the design of these actions. A FS Road Analysis would still be done prior to any work on NF roads.

Management direction would not have to be followed for actions related to mineral and energy development. The primary

effects from mineral and energy development is from access roads that are plowed during winter. These effects are likely to be localized. The only foreseeable activity related to mineral and energy development is related to oil and gas leasing. Nine wells are projected to occur in the future in lynx habitat; three on the Ashley; four on the Beaverhead-Deerlodge and two on the Custer NFs (see Appendix K, Table K-11). Generally, the FS designates the roads to be used for these activities; therefore the effects to lynx would minimal.

Summary for Alternative F, Scenario 2

The FWS *Recovery Outline* says focusing lynx conservation efforts on core areas would ensure the continued persistence of lynx. It goes on to say recovery of lynx would be achieved when conditions have been attained that would allow lynx populations to persist in the long-term and within each of the identified core areas (USDI FWS 2005a).

The management direction under Alternative F, Scenario 2 would apply to all core areas because all core areas are occupied. The management direction also would apply to all areas identified as secondary habitat that are currently occupied by lynx. Core and secondary units occupied at this time include the Flathead, Kootenai, Lolo, Idaho Panhandle, Targhee, Bridger-Teton, Shoshone, and Clearwater NFs, and portions of the Custer, Gallatin, Helena and Lewis and Clark NFs (see Table 1-1, on p. 5 and Figure 1-1).

Applying the management direction to occupied core and secondary habitat would: (1) retain adequate habitat of sufficient quality to support the long-term persistence of lynx populations; (2) ensure sufficient habitat is available to accommodate the long-term persistence of immigration and emigration between core areas and adjacent populations in Canada or secondary areas in the United States; (3) ensure habitat in secondary areas remains available for continued occupancy by lynx; and (4) ensure threats have been addressed so lynx populations would persist.

The Beaverhead-Deerlodge, Bitterroot, Nez Perce and Salmon Challis NFs are secondary habitat and unoccupied. Habitat in these areas may be modified in a way where the structure and composition of vegetation would be less capable of supporting lynx. However, given the ten year program of work for the major activities that affect lynx habitat, adverse habitat modification is unlikely to occur over a large area (see Tables 3-23 and 3-24). Management direction may still be considered in the design of projects in these areas. If, in the future, lynx are found to occupy these units, then the management direction would be applied.

About 1 million acres of lynx habitat is unoccupied and is considered peripheral habitat. This includes the Ashley and Bighorn NFs and the Pryor Mountains on the Custer NF and the Highwood and Snowy Mountains on the Lewis and Clark NF. Habitat in these areas may be modified in a way where the structure and composition would be less capable of supporting lynx. More habitat may be modified in these peripheral areas, but

even then, not all lynx habitat would be affected (see Tables 3-23 and 3-24). These areas have not been identified as needed for lynx conservation and recovery (USDI FWS, 2005a).

Cumulative effects

Alternative A

Management actions allowed by existing plans in the developmental land allocations on federal lands have the potential to adversely affect lynx (Hickenbottom et al. 1999). The activities identified as risk factors for lynx were incorporated into the analysis in the preceding section.

Management practices on state, corporate, and small private lands may also present a risk to lynx persistence in the long term. Preliminary research conducted on privately-owned corporate timber lands in northwestern Montana show that such lands provide varying levels of snowshoe hare densities (abundant to low), depending on the timber harvest regime (Appendix P).

Several private timber companies have developed lynx management plans. These companies are Boise Cascade Corporation (central Idaho and eastern Washington), Plum Creek Timber Company, Ltd. (Idaho and Montana) and Stimson Timber Company (northern Idaho and eastern Washington). These plans are generally developed to respond to the legal requirement that on private lands a landowner is required to not take actions that would result in the "taking" of lynx as defined under the Endangered Species Act (ESA 1973 as amended). These private lands are not required to manage habitat for the conservation of lynx. A small portion of the Idaho Panhandle National Forest occurs within Washington State and the Washington Department of Fish and Wildlife has developed a *Lynx Recovery Plan* for that state (Stimson 2001). The Montana Department of Natural Resources (DNRC) has also developed a Habitat Conservation plan (HCP) as a Canada Lynx Conservation Strategy (DNRC 2005). Therefore, these plans provide for some lynx habitat needs on private lands.

The presence of major highways through the area, several large reservoirs, and residential and urban development pose movement obstacles.

Management direction incorporated through the PACFISH and INFISH amendments, the off-highway vehicle (OHV) amendment, Healthy Forest Rangeland Initiative, and Roadless Policy provides improved habitat conditions for lynx – see Appendix L. The two large national parks, Glacier and Yellowstone, provide large secure blocks of habitat.

Cumulatively, the past, present, and reasonably foreseeable programmatic actions described in Appendix L would generally improve habitat conditions for lynx. However, since existing plans would still lack management direction to reduce threats to lynx, adverse effects would continue.

Alternatives B, C, D, E & F

The action alternatives would incorporate management direction - to varying degrees - that would reduce or eliminate adverse effects from management actions in the planning area. The alternatives incorporate management direction to address programmatic direction for certain activities. For example, national policy and Congressional intent has established that reducing fuels within the WUI, as well as other areas, is an important focus on NFS lands. Because of this focus, the effects from these programs (National Fire Plan, Healthy Forests Initiative, and Healthy Forests Restoration Act) on lynx have been evaluated, including their potential cumulative effects.

Management direction would result in improved lynx habitat and connectivity. Cumulatively, this direction would have some beneficial effects on lynx. Activities on corporate and small private lands could still adversely affect lynx; however, the management direction requires consideration of activities on private land when evaluating the effects of projects on federal land.

Northern Rockies Geographic Area

Several NFs and BLM units in the geographic area are not included in this proposal. Some have revised their plans, or are currently revising and have or would incorporate management direction for lynx. Others will be revising or amending plans in the near future and are considering the LCAS during project analysis - see Appendix D. The new direction should result in improved lynx habitat conditions.

United States

A similar effort is going on in the Southern Rockies Geographic Area, and the Great Lakes Forests have already amended their plans. Units in other geographic areas will incorporate management direction into their plans in the next several years—if they have not done so already. As these plans are updated, they should result in cumulative beneficial effects on lynx.

Other wildlife & fish

TEP species

Lists of threatened, endangered, and proposed (TEP) species for NFS lands that overlap lynx habitat were compiled – see Appendix H. Table 3-25 identifies the TEP species that may be affected by the proposal.

Various literature sources were reviewed to evaluate the occurrence of species within lynx habitat and the potential effects of various alternatives on TEP species (Ehrlich et al. 1988, Johnsgard 1990, Martin et al. 1951, Nusssbaum et al. 1983, Schmidt et al. 1978, Sibley 2000, Whitaker 1996). Species information was also reviewed on the *NatureServe* website. This database contains comprehensive species information including habitat relationships. *NatureServe* can be access via the following link: http://www.natureserve.org/explorer

The habitats of woodland caribou, bonytailed chub, Colorado pikeminnow, humpback chub, Kendall Warm Springs dace, pallid sturgeon, razorback sucker, white sturgeon, and bald eagle overlap lynx habitat. These species would not be affected by the management direction in any alternative because suitable habitat is not present and/or the management direction does not affect their habitat. Therefore, these species are not discussed further.

Alternative A, no action

The no-action alternative includes the direction in existing plans. Alternative A would add no new management direction to conserve lynx.

Indirect effects on TEP species
There would be no change in effects on fish and wildlife resources from those of existing plans. Management area objectives, standards, and guidelines would remain unchanged.

Alternatives B, C, D, E & F Scenario 1

Alternative B, the Proposed Action, would add management direction for lynx about:

- Vegetation management
- Winter snowshoe hare habitat

Table 3-25. TEP species that could be affected by the proposed management direction

	Mammals	Fish
Threatened		
	Canada lynx ‡	Bull trout ‡
	Grey wolf ‡	Chinook salmon
	Grizzly bear ‡	Steelhead trout
Endangered		
	Grey wolf ‡	Sockeye salmon

‡ Management indicator species (MIS) on some units

- Lynx denning habitat
- Livestock grazing
- Winter recreation
- Minerals and energy exploration and development
- Roads and highways

Alternatives C, D, E, and F Scenario 1 add similar management direction with some variations. Alternative F, Scenario 1 applies the management direction to all lynx habitat in LAUs. The effects of the alternatives on TEP species listed in Table 3-25 are discussed below. Beneficial and/or detrimental effects are likely to be immeasurable due to the low amount of acreage potentially affected in lynx habitat.

Grey wolf & grizzly bear

Efforts to recover *grey wolf* populations include different approaches in different places. The wolves that naturally re-colonized in northwest Montana and in Idaho north of Interstate 90 are a fully protected endangered species, but the reintroduced wolves in the Greater Yellowstone area and central Idaho are designated as nonessential experimental populations.

Grizzly bears are a threatened species in four ecosystems – the Selkirk in northern Idaho, the Cabinet-Yaak in northwestern Montana and northern Idaho, the Northern Continental Divide in western Montana, and the Yellowstone in southwestern Montana and portions of Wyoming and Idaho.

All alternatives, to different degrees, may beneficially affect both grizzly bears and grey wolves by maintaining riparian habitat, reducing the disturbance associated with minerals and human uses, reducing habitat fragmentation, and providing for animal movement.

Grey wolves may benefit from the guidance to retain foraging habitat for snowshoe hare.

Standards VEG S5 and VEG S6 could reduce the forage available for bears and big game, the wolves' primary prey, by limiting the growth of grasses, forbs, and shrubs. Alternatives D, E, and F would allow some vegetation management to occur in winter snowshoe hare habitat, so would not reduce the forage as much as Alternatives B or C.

Alternative F Scenario 2

Alternative F Scenario 2 would have similar effects as described above except the management direction would not have to be applied to the Nez Perce, Salmon-Challis, Beaverhead-Deerlodge, Bitterroot, Ashley and Bighorn National Forests, and the disjunct mountain ranges on the Custer, Gallatin, Helena and Lewis and Clark NFs until these areas are occupied by lynx. On these units there would be no change in effects on fish and wildlife resources from those of existing plans while they remain unoccupied. If the areas become occupied at a future time, then the effects on these units would be the same as Alternative F, Scenario 1, described above and below.

TEP fish

Four threatened or endangered fish occur in the planning area that could be affected (Table 3-25). Guidelines HU G6 and G7 could increase the sediment delivered to streams if they limit paving and result in roads on side-slopes. However,

guidelines can be deviated from if reasons exist. During the next five years, paving is planned for only two miles of road, and road construction on ridge-tops is planned for only seven miles. Therefore, the effect of these guidelines is negligible.

The alternatives propose management direction for livestock grazing similar to the PACFISH and INFISH direction amended into the existing plans of most units west of the Continental Divide. For units east of the Continental Divide whose plans do not contain similar direction, adding this grazing direction may beneficially affect fish by managing riparian-area grazing to achieve conditions similar to historic.

Sensitive species

For the FS, a *sensitive species* is one designated by the Regional Forester because of concern about the viability of its population as evidenced by significant current or predicted downward trends:

- In population numbers or density
- In habitat capability that may reduce an existing species' distribution

Since Regional Forester's Sensitive Species are not covered under ESA, management direction is provided by FS policy in Forest Service Manual 2670.

Lists of sensitive species for the three FS regions were compiled where they overlap lynx habitat – see Appendix H. Table 3-26 lists the sensitive species that may be affected by the proposal; the effects are discussed below. Other sensitive species are not affected by the proposal because their habitat would not be affected, so they are not discussed further – see Table 3-27.

Table 3-26. Sensitive species that could be affected by the proposed management direction

Mammals	Birds	Fish	Amphibians
Species detrimentally affected			
	Hammonds flycatcher		
Species beneficially affected			
Wolverine ‡	Blackbacked woodpecker ‡		Boreal toad
	Three-toed woodpecker ‡		Northern leopard frog
	White-headed woodpecker		
Species beneficially and detrimentally affected			
Fisher ‡	Boreal owl ‡	Artic grayling ‡	
Marten ‡	Great gray owl ‡	Bonneville cutthroat trout ‡	
	Northern goshawk ‡	Burbot	
	Olive sided flycatcher	Colorado River cutthroat trout ‡	
		Interior redband trout	
		Mountain sucker	
		Pacific lamprey	
		Snake River spring/summer chinook ‡	
		Snake River cutthroat trout	
		Westslope cutthroat trout ‡	
		Yellowstone cutthroat trout ‡	

‡ MIS species on some units

Table 3-27. Sensitive species not affected, but with habitat in the planning area

Mammals	Birds	Amphibians & reptiles	Invertebrates
Fringed myotis	Baird's sparrow	Coeur d'Alene salamander	Hudsonian emerald
Great basin pocket mouse	Black swift	Great Plains toad	
Long eared myotis	Black tern	Greater short-horned lizard	
Long legged myotis	Blue-gray gnatcatcher	Milk snake	
Northern bog lemming	Brewer's sparrow ‡	Plains spadefoot toad	
Pallid bat	Burrowing owl	Ringneck snake	
Pygmy rabbit	Common loon ‡	Spotted frog ‡	
River otter	Ferruginous hawk ‡	Western hognose snake	
Spotted bat	Flammulated owl ‡	Wood frog	
Townsend's big eared bat ‡	Grasshopper sparrow		
Water vole	Harlequin duck ‡		
	Lewis' woodpecker		
	Loggerhead shrike		**Fish**
	Long-billed curlew		Northern red belly dace
	Mountain plover		Sturgeon chub
	Mountain quail		
	Northern harrier		
	Peregrine falcon ‡		
	Pygmy nuthatch		
	Sage grouse ‡		
	Sage sparrow		
	Short eared owl		
	Trumpeter swan ‡		
	Yellow-billed cuckoo		

‡ MIS species on some units

Alternative A, no action

Alternative A, the no-action alternative, would add nothing to existing plans.

Indirect effects on sensitive species

Alternative A would not change the effects on fish and wildlife from those of the existing plans.

Alternatives B, C, D, E & F Scenario 1

Alternatives B, C, D, E, and F add similar management direction; however, there are some variations among the alternatives. Alternative F Scenario 1 would apply the management direction to all lynx habitat in LAUs. The effects of the alternatives on sensitive species listed in Table 3-26 are discussed. Beneficial and/or detrimental effects are likely to be immeasurable due to the low amount of acreage potentially affected in lynx habitat.

Sensitive mammals

Fisher, martin & wolverine

Wolverines may benefit from Standard HU S1 (in Alternatives B and C) or Guideline HU G11 (in Alternatives D, E, and F) that limits over-the-snow use in new areas and from Standard HU S3 and Guidelines HU G3 and HU G9 that result in reducing disturbance. Wolverines may also benefit from Standard VEG S4 (in Alternatives B and C) or Guideline VEG G7 (in Alternative D and E) or Guideline VEG G11 (in Alternative F) that retains dead and down material.

Standards VEG S5 and VEG S6 under Alternatives B, C, D, and F and Guideline VEG G8 under Alternative E, would maintain dense stands for the prey species *martens, fishers,* and wolverines rely on. Deferring vegetation management activities in winter snowshoe hare habitat would reduce the amount of human disturbance in some areas, which may also benefit wolverines.

However, deferring activities until winter snowshoe hare habitat is no longer provided could delay the development of mature stands, affecting when mature stands would be available. Even so, fire, and insects and disease would continue to suppress or kill some trees, releasing the growth of others to mature into large trees – see the *Forests* section later in Chapter 3.

Alternatives B and C would have similar effects. Alternative D would allow vegetation management under certain conditions that could result in more stands growing into mature, large trees.

Under Alternative E, fuel treatments would be allowed under Standard VEG S5, and Standard VEG S6 is dropped and replaced by Guideline VEG G8. Prey species that rely on dense stands may not be as abundant if fuel treatments reduce habitat density. It is likely that not all winter snowshoe hare habitat would be treated. Based on the projected annual fuels program, about five percent of winter snowshoe hare habitat may be reduced under Alternative E.

Under Alternative F Scenario 1, fuel treatments within the WUI would be allowed under Standard VEG S5 and VEG S6 – but would be limited to modifying six percent of lynx habitat. Prey species that rely on dense stands may not be as abundant in these areas.

Alternative F Scenario 2

Alternative F Scenario 2 would have similar effects as described above except the management direction would not have to be applied to the Nez Perce, Salmon-Challis, Beaverhead-Deerlodge, Bitterroot, Ashley and Bighorn National Forests, and the disjunct mountain ranges on the Custer, Gallatin, Helena and Lewis and Clark NFs until these areas are occupied by lynx. On these units there would be no change in effects on sensitive mammals, birds, amphibians or fish from those of existing plans while they remain unoccupied. If the areas become occupied at a future time, then the effects on these units would be the same as Alternative F, Scenario 1, described in the previous and following sections.

Sensitive birds

Sensitive bird species would be affected mostly by vegetation management direction about retaining dead and down trees and the activities allowed in winter snowshoe hare habitat.

Black-backed woodpeckers, three-toed woodpeckers, and *white-headed woodpeckers* all feed on the insects and nest in the cavities found in dead and dying trees. Standard VEG S4 under Alternatives B and C, Guideline VEG G7 under Alternatives D and E, and Guideline VEG G11 under Alternative F would result in retaining more dead and down timber than the existing plans. Any increase in disease or tree mortality would be good for woodpeckers and sapsuckers.

Therefore, the action alternatives may benefit them.

Standards VEG S4 and VEG S5 could either retain or decrease habitat for *boreal owls, great grey owls, northern goshawks, olive-sided flycatchers and pygmy nuthatch.* These birds use dead and down trees as nesting sites, and the trees provide habitat for the small mammals on which they prey.

Standard VEG S4 or Guidelines VEG G7 or VEG G11 would retain more dead and down habitat than existing plans. Standard VEG S4 could decrease the amount of older forested habitat due to increased mortality from insects and disease. However, it is likely the decrease would be minimal since the standard applies only to areas smaller than five acres that have been disturbed by fire or insect and disease.

Standard VEG S5 would retain the dense regenerating stands that provide habitat for prey species and could delay the development of mature forests. This may affect birds that use these stand conditions.

Sensitive amphibians

Boreal toad and *northern leopard frog* may be affected by road Guidelines HU G6 and HU G7. These guidelines could limit paving and would recommend building roads on side slopes, which may result in increased sediment delivered to streams. However, little paving or road construction is planned in the planning area, so the effect likely would be negligible.

Grazing standards may beneficially affect amphibians by managing livestock grazing in riparian areas.

Sensitive fish

Eleven sensitive fish species occur in the planning area that could be affected by the proposed management direction (Table 3-26). The effects on sensitive fish are the same as those described for TEP fish.

MIS species

Table 3-28. MIS species that could be affected by the proposed management direction

Mammals	Birds	Fish	Invertebrates
Species beneficially affected			
Beaver	Blue grouse		
Moose	Downy woodpecker		
	Hairy woodpecker		
	Mountain bluebird		
	Northern flicker		
	Red breasted nuthatch		
	Ruby-crowned kinglet		
	Willow flycatcher		
	Yellow bellied sapsucker		
	Yellow warbler		
Species affected both beneficially and detrimentally			
Black bear	Pileated woodpecker	Brook trout	Macro invertebrates
Bobcat		Cutthroat trout	
Elk		Rainbow trout	
Mule deer		Trout	
Red squirrel			
White-tailed deer			

Management indicator species (MIS) are managed under the authority of NFMA. MIS are listed in existing plans; Appendix I identifies MIS that overlap lynx habitat.

Several MIS species are also TEP or sensitive species, as noted with a "‡" in Tables 3-25, 3-26, and 3-27. Those species have been discussed previously and will not be discussed further.

Table 3-28 lists the MIS species that may be affected by the proposal; the effects are discussed below. Other species are not affected by the proposal because their habitat would not be affected, so they are not discussed further – see Table 3-29.

Table 3-29. MIS (not TEP or sensitive) <u>not</u> affected, but with habitat in planning area

Mammals	Birds		Fish
California bighorn sheep	Belted kingfisher	Ruffed grouse	Large mouth bass
Bighorn sheep	Golden eagle	Rufus-sided towhee	
Montane vole	Lark sparrow	Vesper sparrow	
Mountain goat	Lincoln's sparrow	Warbling vireo	
Mountain lion	Northern oriole	White-crowned sparrow	
Northern bog lemming	Ovenbird	White-tailed ptarmigan	
Water shrew	Prairie falcon		
Western jumping mouse			

Alternative A, no action

Alternative A, the no-action alternative, would add no new management direction for lynx to existing plans.

Indirect effects on MIS species
Alternative A would not change the effects on fish and wildlife from those described in the existing plans.

Alternatives B, C, D, E & F Scenario 1

Alternatives B, C, D, E, and F Scenario 1 add similar management direction; however, there are some variations among the alternatives. These alternatives would apply the management direction to all lynx habitat in LAUs. The effects of the alternatives on MIS species listed in Table 3-28 are discussed. Beneficial and/or detrimental effects are likely to be immeasurable due to the low amount of acreage potentially affected in lynx habitat.

MIS mammals
Black bear
Some standards may beneficially affect *black bears* by retaining winter snowshoe hare habitat, which may provide for prey, retain denning habitat, maintain riparian habitat, reduce the disturbance associated with minerals, reduce habitat fragmentation, and help provide for animal movement.

Standards VEG S5 and VEG S6 under Alternatives B, C, D, and F and Guideline VEG G8 under Alternative E, could reduce the forage available to bears by limiting the growth of grasses, forbs, and shrubs. Alternatives D, E, and F would allow some vegetation management to occur in winter snowshoe hare habitat; therefore, they would not reduce bear forage as much as Alternatives B or C.

Elk, mule deer, white-tailed deer & moose
Some standards may beneficially affect big game by retaining winter snowshoe hare habitat, which may provide hiding cover, maintain riparian habitat, reduce the disturbance associated with minerals, reduce habitat fragmentation, and help provide for animal movement.

Standards VEG S5 and VEG S6 under Alternatives B, C, D, and F and Guideline VEG G8 under Alternative E, could reduce the forage available for *elk, mule deer*, and *white-tailed deer* by limiting the growth of grasses, forbs, and shrubs; however, these standards maintain hiding cover. Alternatives D, E, and F would allow some vegetation management to occur in winter snowshoe hare habitat, and therefore would not reduce forage as much as Alternatives B or C.

Bobcat
All alternatives may beneficially affect *bobcats* by retaining winter snowshoe hare habitat, maintaining riparian habitat, reducing habitat fragmentation, and providing for animal movement. However, bobcat may be detrimentally affected if their prey species are reduced.

Beaver
All alternatives may beneficially affect *beaver* by maintaining riparian habitat.

Red squirrel
Red squirrels are an alternate prey for lynx. All alternatives may beneficially affect red squirrels. Standard VEG S3 and VEG S6 could result in retaining mature forests, red squirrel habitat.

Standard VEG S4 in Alternatives B and C, Guideline VEG G7 in Alternatives D and E, and Guideline VEG G11 would add management direction to retain dead and down trees where lacking.

Standard VEG S5 could delay the development of mature trees or result in more insect and disease outbreaks, which could reduce squirrel habitat if no other disturbance occurred.

Guideline VEG G5 says habitat for red squirrels should be provided in each LAU. Although guidelines are not mandatory, if this requirement were added to existing plans, it should benefit squirrels.

MIS birds

Blue grouse, yellow warbler, and *willow flycatcher* habitat is associated with riparian areas and willows. Grazing Standards GRAZ S1, GRAZ S2, and GRAZ S3 in Alternatives B and C and Grazing Guidelines GRAZ G1, GRAZ G2, and GRAZ G3 in Alternatives D, E, and F would retain willow, aspen, and riparian habitat, providing additional protection for these birds.

Mountain bluebirds, hairy woodpeckers, downy woodpeckers, northern flickers, red-breasted nuthatches, ruby crowned kinglets, and *yellow-bellied sapsuckers* all feed on the insects and nest in the cavities found in dead and dying trees. Standard VEG S3, in Alternatives B and C could result in retaining habitat beneficial to these species. Standard VEG S4 in Alternatives B and C, Guideline VEG G7 in Alternatives D and E, and Guideline VEG G11 in Alternative F would add management direction to retain small patches of dead and down trees.

Pileated woodpecker is another species that may benefit from this direction. Pileated woodpeckers also use older forests. Standard VEG S4 in Alternatives B and C could result in a reduction of older forests if increased mortality from insects and disease occurred, but it is unlikely there would be large losses because the direction applies only to patches of dead trees smaller than five acres. Standard VEG S6 in Alternatives B, C, D, and F and Guideline VEG G8 in Alternative E retain multistory forests which would benefit pileated woodpeckers.

MIS fish & macro invertebrates

Fifteen MIS fish species occur in the planning area; one NF has identified macro invertebrates as an MIS group. The effects for MIS fish and macro invertebrates are the same as those described for TEP and sensitive fish.

Alternative F Scenario 2

Alternative F, Scenario 2, would have similar effects as described above except the management direction would not have to be applied to the Nez Perce, Salmon-Challis, Beaverhead-Deerlodge, Bitterroot, Ashley and Bighorn National Forests, and the disjunct mountain ranges on the on Custer, Gallatin, Helena and Lewis and Clark NFs until these areas are occupied by lynx. On these units there would be no change in effects on fish and wildlife resources from those of existing plans while they remain unoccupied. If the areas become occupied at a future time, then the effects on these units would be the same as Alternative F, Scenario 1, described in the previous sections.

Cumulative effects

Alternative A

Management direction incorporated through the INFISH and PACFISH amendments, the OHV amendment, additional forest travel planning, the Healthy Forest Rangeland Initiative, and the Roadless Policy provides improved habitat conditions for wildlife and fish by providing secure areas and protecting special habitats, even without the added protections that would be afforded by the lynx management direction

Cumulatively, the past, present, and reasonably foreseeable actions described in Appendix L, would generally improve habitat conditions.

Alternatives B, D, E & F

The action alternatives would incorporate management direction to improve habitat conditions for most species by maintaining riparian habitat, reducing the disturbance associated with minerals and human uses, reducing habitat fragmentation, and providing for animal movement.

As with Alternative A, cumulatively, the past, present, and reasonably foreseeable actions described in Appendix L, in addition to the lynx management direction, would improve habitat conditions.

Fire

Affected environment

Natural disturbances such as fire, wind, and insects and diseases, help shape forests. In the northern Rockies, periodic fire is the dominant disturbance process that changes forests.

While fire is widespread, it is seldom uniform. Every forest has its own characteristic pattern of fire intensity, frequency and size. *Fire regime* and *condition class* are used to characterize fire.

Fire regime
The fire regime describes the historic pattern of fire: how often (frequency); how hot (intensity); and how big (scale). Ecologists often describe three fire regimes for Western forests – *understory, mixed severity* and *stand replacing* (Agee 1993; Agee 2000; Arno and Bunnell 2002; Brown & Smith 2000; Fischer & Bradley 1987; Hessburg & Agee in press; Jones & Barrett in press; Keane et al. 2002; Smith & Fisher 1997).

- *Understory* – Understory fires burn frequently, from once a year, to about once every 35 years, as *low-intensity* surface fires that consume forest litter and kill small trees in small patches. Understory fires generally do not kill large, fire-resistant trees or substantially change the structure of *the forest.*
- *Mixed severity* – Mixed-severity fires burn about every 35 to 100 years, as a *mixture* of *understory* and *stand-replacing* fires, or as *intermediate-intensity* fires that kill fire-susceptible trees while the fire-tolerant trees survive. Mixed-severity fires produce a diverse forest in terms of both structure and species composition. The fires typically are medium sized.
- *Stand replacing* – Stand-replacing fires are infrequent, burning about every 100 to 200 years. Stand-replacing fires are large and *high-intensity,* killing most trees. They make way for a new forest.

Historically, fires at lower elevations tended to be understory and fires at higher elevations stand-replacing, although substantial variability has always existed.

Condition class
Condition class describes the departure from historic conditions based on the number of missed fire cycles and the amount of change in forest structure and species composition (Schmidt et al. 2002).

- *Condition Class 1* – Fires have burned as often as they did historically; the risk of losing key ecosystem components is low. Vegetation composition and structure is intact and functioning.
- *Condition Class 2* – Fires have not burned as often as they did

historically, missing one or more cycles. The risk of losing ecosystem components is moderate, with moderate changes in fire size, intensity, landscape patterns or vegetation.

- *Condition Class 3* – Fires have significantly departed from their historic frequency by missing multiple cycles. The risk of losing ecosystem components is high, with dramatic changes to fire size, intensity, landscape patterns, or vegetation.

Lynx habitat occurs in three kinds of forests in the planning area:

- *Mixed conifer*, which includes Douglas fir, western larch, grand fir, and western red cedar
- *Spruce/fir*, which includes Engelmann spruce, subalpine fir, alpine larch, hemlock, and whitebark pine
- *Lodgepole pine*

Table 3-30 describes the fire regimes and condition classes of the three kinds of forests that constitute lynx habitat in Montana.

In mid-elevation *mixed conifer forests,* fires range from understory to stand replacing. Fire suppression has limited how often fires burn. Some places have missed one or more fire cycles and fall into Condition Classes 2 or 3. Others are closer to historic conditions, in Condition Class 1.

Today, mixed conifer forests are generally denser and contain fewer fire tolerant species like western larch and ponderosa pine than when low- to intermediate-intensity fires kept parts of the forest thinned out (Quigley et al. 1996). Forest conditions today contribute to greater numbers of large high intensity fires.

In high-elevation *spruce/fir* and *lodgepole pine forests,* infrequent, severe fires are the norm. Because fires burn only about every 100 to 200 years in these cold, moist, high-elevation forests, fire suppression has had less of an effect than in other fire regimes. These naturally dense forests are close to historic conditions, generally in Condition Class 1.

Excluding fire has also reduced the role played by low- and intermediate-intensity fires. At higher elevations, such fires kill competing fir and spruce trees so whitebark pine can grow and some lodgepole pine can develop old growth characteristics.

Fire suppression has changed the natural age distribution of forests at the landscape level. Stand-replacing fires used to create

Table 3-30. Lynx habitat by forest type, fire regime & condition class in Montana

Forest type	Fire regime	Condition class	Estimated % lynx habitat
Mixed conifer	Mostly mixed severity	1, 2 or 3	26%
Spruce/fir	Mostly stand replacing with some mixed severity	1	40%
Lodgepole pine	Mostly stand replacing with some mixed severity	1	34%

a mosaic of even-aged forests across the landscape. Today there are proportionately fewer young even-aged forests and more, older forests (Hessburg et al. 1999; Hillis et al. 2003; Losensky 2002). Excluding fire has resulted in a more homogenous landscape with an increased potential for larger stand-replacing fires.

In dry, warm low-elevation forests, frequent low-intensity fires are the norm, maintaining stands of large, widely spaced trees. Fire suppression and fire exclusion has resulted in making many of these forests unnaturally dense, and the species composition has shifted away from ponderosa pine to Douglas fir.

These forests are where the greatest detrimental effects of excluding fire can be seen. These forests are in Condition Classes 2 and 3 (Arno & Bunnell 2002); these forests are not lynx habitat.

Policy

After 1910, when wildfires burned three million acres and killed 85 people in northern Idaho and western Montana, the Forest Service began to direct serious efforts toward suppressing wildfires. Severe fires occurred again in 1919, 1924, 1925, and 1934. In 1935, the agency adopted the "10 am policy," which said all fires were to be controlled by 10 am the day following their discovery. The policy was repealed in 1973 as the agency shifted from simply controlling fire to managing it and using it as a tool on federal lands.

Fire suppression for the last 80 years, along with grazing and logging, has changed the way fires burn and changed the age, species, and structure of some forests (Quigley et al. 1996). Further, as people have built more homes in the woods, the ability to allow fire has decreased even as the fire risk has increased.

The results of excluding fire became increasingly apparent during the last decade of the 20th century. The federal government re-examined wildland fire policies. In 1995, the *Federal Wildland Fire Management Policy* was written to recognize the essential and inevitable role of fire, and the need to return, not eliminate, fire from forests.

Other recent documents set goals for wildland fire policy:

- *Managing the Impact of Wildfires on Communities & the Environment - the National Fire Plan* (USDA FS & USDI 2000)
- *A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment; 10-Year Comprehensive Strategy (USDA FS 2001a)*
- *The Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment: 10-Year Comprehensive Strategy Implementation Plan (USDA FS 2002).*

In May 2003 a Memorandum of Understanding (MOU) was signed among the five federal agencies responsible for managing Federal lands prone to wildfire. This MOU bound the signatories to developing an interagency Cohesive Fuels Treatment Strategy (USDA FS, USDI 2003).

In February 2006 the Cohesive Fuels Treatment Strategy was signed (USDI

and USDA FS, 2006). This strategy aims to lessen risks from catastrophic wildfires by reducing hazardous fuels build-up with an emphasis on protecting communities.

In summary, these documents serve to provide a national prioritization system for the selection of hazardous fuel treatments on Federal lands with close coordination among the Federal, State, and other agencies as well as Tribes and communities. The criteria for prioritizing lands for hazardous fuels treatment generally correspond to: (1) closest proximity to communities at risk in the WUI; (2) strategic areas outside the WUI that prevent wildland fire spread into communities or critical infrastructure; (3) areas outside of WUI that are in Condition Classes 2 or 3; and (4) other considerations.

In addition to agency emphasis on reducing hazardous fuels, in 2003 Congress passes the Healthy Forests Restoration Act (HFRA) (H.R.1904). The purpose of the act is to improve the capacity of the Forest Service and BLM to conduct hazardous fuels reduction projects aimed at protecting communities, watersheds and certain other at-risk lands from catastrophic wildfires. The act further defined WUI.

WUI

In *the Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment: 10-Year Comprehensive Strategy Implementation Plan* WUI is defined as "the line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuel". The Compressive Strategy says to focus hazardous fuel reduction treatments in the WUI and in Condition Classes 2 or 3 in fire regimes 1, 2, or 3 outside the WUI, and which are identified as high priority through collaboration consistent with the Implementation Plan.

The HFRA, §101 further defined WUI as:

A. an area within or adjacent to an at-risk community that is identified in recommendations to the Secretary in a community wildfire protection plan.

B. in the case of any area for which a community wildfire protection plan is not in effect –
   i. an area extending ½ mile from the boundary of an at-risk community;
   ii. an area within 1 ½ miles of the boundary of an at-risk community, including any land that –
      i. has a sustained steep slope that creates the potential for wildfire behavior endangering the at-risk community;
      ii. has a geographic feature that aids in creating an effective fire break, such as a road or ridge top; or
      iii. is in condition class 3, as documented by the Secretary in the project-specific environmental analysis; and
      iv. an area that is adjacent to an evacuation route for an at-risk community that the Secretary determines, in cooperation with the at-risk community, requires hazardous fuel reduction to

provide safer evacuation from the at-risk community.

In order to evaluate effects of management direction on the ability to reduce hazardous fuels – specifically hazardous fuels adjacent to communities, WUI was approximated for the planning area. How WUI was evaluated was changed between the draft and final EIS to more closely align with the definition in the HFRA. In the DEIS, WUI was defined as the zone within a mile of where people live, liberally measured as just one person per 10 square miles.

In the FEIS, WUI has been defined as the zone within a mile of where people live – based on:

(1) The federal register lists of at-risk communities published in January 2001 and August 2001. (USDA FS, USDI BIA, BLM, FWS, NPS 2001a and 2001b)
(2) Year 2000 population census data was used to indicate where interface (population density of 250 or more per square mile) and intermix communities (population density of 28-250 people per square mile) are as described in the January 2001 *Federal Register Notice*. The Notice says the federal agencies will focus on communities in the interface or intermix category. The HFRA indicates that both types of communities may be "at-risk".
(3) A 1 mile buffer from communities was used because HFRA describes WUI as ½ mile or 1 ½ miles depending on certain features. One-mile splits this difference and is easy to approximate.

Based the above assumptions, about 3.7 million acres are in the WUI in the planning area, of which about 25 percent or 963,000 are lynx habitat – see Table 3-31.

Table 3-31. Acres within WUI and outside WUI, by State and lynx habitat

State	Acres of WUI	Acres of lynx habitat in WUI	Acres Outside WUI	Acres of lynx habitat outside WUI
Idaho	1,102,100	226,790	11,607,500	5,533,210
Montana	2,450,400	649,300	15,004,200	8,410,700
Wyoming	138,400	59,300	6,843,700	2,890,700
Utah	56,000	27,200	1,328,100	672,800
Total	3,746,900	962,590	34,783,500	17,507,410

See Appendix M for further detail and the project record (analysis/fire/FEIS/data).

Hazardous fuels reduction program

Congress annually sets goals, program size, and emphasis through its appropriations. Table 3-32 summarizes the projected fuels program over the next decade state.

Inside the WUI, fuel treatments most likely would be within a mile of structures and designed to reduce the intensity and spread of fire to communities. Many treatments would occur in the dry, low-to mid-elevation forests and sagebrush lands that have missed one or more fire cycles and are in Condition Classes 2 and 3. However, some may occur in Condition Class 1 forests, especially those experiencing insect and disease outbreaks.

At current and projected funding levels, about 86,000 acres or two percent of the WUI would be treated annually.

Outside the WUI, fuel treatments most likely would be designed to restore or maintain a semblance of the forest structure historically produced by fire. Generally, fuel reduction would occur on lands in Condition Classes 2 or 3, and fuel maintenance in Condition Class 1 lands. Other priorities include treating municipal watersheds, key habitat areas near key infrastructure, and areas experiencing or imminently threatened by insect and disease infestations (USDI, USDA 2006).

Annually about 131,000 acres would be restored or maintained by using prescribed fires and removing vegetation, generally in areas that have missed one or more fire cycles or areas with insect and disease infestations. Vegetation may be removed to reduce fire intensity before burning or as the sole method of treatment.

Based on the units five-year integrated strategies, at least 50 percent of all fuel treatments (in and out of WUI) would be completed with prescribed burns - and not mechanical harvest (project record - analysis/fire/FEIS/data).

Table 3-32. 10 year fuels program by State—in and out of WUI

	Inside WUI	Outside WUI	Total Acres
Idaho	168,000	429,000	597,000
Montana	513,000	424,000	937,000
Wyoming	119,000	257,000	376,000
Utah	64,000	199,000	263,000
Total	864,000	1,309,000	2,173,000

See Appendix M for further detail and the project record (analysis/fire/FEIS/data)

Overlap of fuel treatments and winter snowshoe hare habitat

FIA data for Region 1, Montana, was used to find how often fuel treatments might affect winter snowshoe hare habitat where management restrictions may apply. Three key assumptions were used in this analysis:

- Fuel treatments would occur evenly across the landscape, regardless of condition class;
- The WUI was defined as the zone within a mile of where people live, measured as 28 people per square mile; and
- Winter snowshoe hare habitat is composed of both high- and low-density forests – see the *Lynx* section.

Table 3-33 shows how much winter snowshoe hare habitat is estimated to be inside and outside the WUI.

Conditions in Montana can be summarized as follows:

1) About 52 percent[1] of the NF acres in Montana are lynx habitat
2) About 26 percent[2] of the WUI is lynx habitat
3) About 4 percent[3] of the WUI is high-density forests
4) About 4 percent[4] of the WUI is low-density forests
5) About 8.4 million acres, or about 4 percent[5] of the NF acres in Montana, are lynx habitat inside the WUI

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[1] 9,060,000 / 17,454,000 = 52%

[2] 649,000 /2,450,400 = 26%

[3] 109,000 /2,450,400 = 4%

[4] 109,000 /2,450,400 = 4%

[5] 649,000 / 17,454,000 = 4%

Table 3-33. Acres of winter snowshoe hare habitat by density and size in Montana and the distribution by area

	Lynx habitat	High-density		Low-density	
		Young	Multistory	Young	Multistory
Inside WUI	649,300	61,000	41,000	55,000	61,000
Outside WUI	8,410,700	676,000	1,079,000	491,000	751,000
Wilderness	1,856,000	157,000	355,000	198,000	198,000
Total	9,060,000	894,000	1,475,000	744,000	1,010,000

Effects

Three factors influence fire behavior - weather, topography, and vegetation. Land managers can modify only vegetation.

The vegetation characteristics that influence fire behavior are the species composition, and the amount and arrangement of the vegetation.

Fuel treatments change fire behavior by changing the arrangement or reducing the amount of vegetation, which reduces how hot fires can burn. Fuel treatments are designed to reduce the spread and intensity of surface fire, and the initiation and spread of crown fire. Fuels can be reduced by burning or by physically removing vegetation.

Many fuel treatments designed to reduce the fire risk to communities occur within a mile of structures. Others may take place several miles away, when topography, wind patterns, and fuels combine to create the potential for fire to spread to a community. (USDI, USDA 2006)

For structures to be protected, landowners must clear the fuels 100 to 200 feet away from structures and build or change their structures to be fire-resistant (Cohen, 2000 a & b).

While fuel treatments do not prevent fires, they do increase the likelihood that structures would be left standing after fire. Even when the fuels have been treated, fires may still threaten communities and be outside the control of firefighters during extreme weather conditions.

Since fire is a natural and necessary forest disturbance process, the goal of some fuel treatments is to restore and maintain the presence of fire. The health of some forests is declining because fire has been excluded. Treatments are designed to resemble historic fire, or to reduce vegetation so when fire does occur, it would behave more like it did under historic conditions.

Restoration and maintenance are not directly associated with protecting homes in the WUI. However, depending on their location, such treatments may contribute to reducing the threat of crown fires to communities (Finney 2001).

Table 3-34. Projected ten-year fuel treatment program in the WUI*

State	Total fuel treatment program in WUI	Fuel treatment potentially *in lynx habitat* in WUI	Fuel treatment program *outside lynx habitat* in WUI
FS-Idaho	168,000	46,230	121,770
FS-Montana	513,000	151,630	361,370
FS-Utah	64,000	31,360	32,640
FS-Wyoming	119,000	54,870	64,130
Total	864,000	284,090	579,910

** See Appendix M Table M-2

Table 3-35. Projected ten-year fuel treatment program outside the WUI*

State	Total fuel treatment program outside WUI	Fuel treatment potentially *in lynx* habitat *outside WUI*	Fuel treatment program *outside lynx* habitat *outside WUI*
Idaho	429,000	203,000	226,000
Montana	424,000	185,020	238,980
Utah	199,000	101,490	97,510
Wyoming	257,000	107,840	149,160
Total	1,309,000	597,350	711,650

* See Appendix M

Alternative A, no action

Under the no-action alternative, agencies would implement the *National Fire Plan,* the *10-Year Comprehensive Strategy,* and the *Healthy Forests Initiative* within the direction set by existing plans.

In the planning area, about 2.2 million acres of fuel treatment are projected for the next decade. About 864,000 acres are inside the WUI (40 percent) and 1,309,000 acres are outside the WUI – see Table 3-32.

Within the WUI, of the 864,000 acres projected to be treated over the next decade about 284,000 acres or 32 percent are likely to be in lynx habitat – see Table 3-34. The no-action alternative would allow fuel treatments inside lynx habitat.

Outside the WUI, of the 1,309,000 acres projected to be treated over the next decade about 597,000 acres or 45 percent are likely to be in lynx habitat – see Table 3-35. The no-action alternative would allow fuel treatments inside lynx habitat.

Alternatives B, C, D, E & F Scenario 1

Under alternatives B, C, D, E and F Scenario 1, agencies would add management direction that would apply to fuel treatments in all lynx habitat in LAUs. The management direction for these alternatives does not affect fire suppression – that is an emergency – or wildland fire use, which replicates the natural role of fire and typically occurs in wilderness areas. See Table 2-1 in Chapter 2.

Objectives VEG O1 & VEG O3

- Objective VEG O1 says to manage vegetation similar to historic patterns while maintaining the habitat components that help conserve lynx.
- Objective VEG O3 says to use fire to restore ecological processes and maintain or improve lynx habitat.

Both objectives are compatible with the *National Fire Plan* and the *10-Year Comprehensive Strategy*. The objectives support mechanically

removing vegetation and using fire to maintain and restore wildlands consistent with historic disturbance patterns.

Standard VEG S1
Standard VEG S1 says vegetation management projects may not result in more than 30 percent unsuitable habitat (stand initiation structural stage that does not yet provide winter snowshoe hare habitat) unless a broad-scale assessment substantiates higher historic levels. This standard applies to regeneration harvest. Many fuel treatments are designed to thin the understory and would not result in regeneration.

Alternative B
Under Alternative B, Standard VEG S1 would apply the 30 percent limit to a single LAU.

In Region 1, less than 13 percent of the LAUs currently exceed 30 percent unsuitable, mostly due to large wildfires (Hillis et al. 2003). The impact of the 30 percent standard limiting fuel treatments would be small because most LAUs are well within the standard. LAUs that do not meet the standard are less likely to need regeneration harvest to reduce fuels.

Alternative C
Under Alternative C, Standard VEG S1 would apply the 30 percent limit to a single LAU or a fixed combination of adjacent LAUs, but would not limit prescribed fires. Outside winter snowshoe hare habitat, vegetation could be removed to treat fuels before burning was done.

Mechanical fuel treatments may be prohibited in a few areas where large fires have burned, such as the 1988 Yellowstone fires (Hillis et al. 2003). The effects would be less than those under Alternative B.

Alternative D
Under Alternative D, Standard VEG S1 would apply the 30 percent limit to a sub-basin or isolated mountain range.

Prescribed fires and mechanical fuel treatments would be prohibited only in a very few areas that have had large landscape fires (Hillis et al. 2003). The effects would be less than those under Alternative C.

Alternative E
Under Alternative E, Standard VEG S1 would not apply to fuel treatments developed through a collaborative process; therefore, it would not constrain them.

Alternative F
Under Alternative F, Standard VEG S1 would not apply to fuel treatment projects within the WUI as defined by HFRA. Therefore if a fuel treatment in a WUI resulted in a stand initiation structural stage (equivalent to regeneration harvest) then the standard would not apply. The standard would apply to fuel treatments outside the WUI. In addition, Guideline VEG G10 says to consider Standard VEG S2 in

designing fuel treatment projects in the WUI.

The standard and guideline would have little to no effect on fuel treatment projects within the WUI that result in regeneration. Generally, projects can be designed to meet the standard, but if regeneration is needed to reduce fuels then this would be an appropriate reason for deviation.

Under Alternative F, the standard would be applied to an LAU; therefore there may be some cases where fuel treatments outside the WUI would be constrained. As noted above it is likely this would not happen often as most LAUs are not near having 30 percent of lynx habitat in a stand initiation structural stage.

Standard VEG S2
Standard VEG S2 says timber projects may not regenerate more than 15 percent of lynx habitat in an LAU in a ten-year period.

Many fuel treatments are designed to thin forests, not regenerate them. However, some fuel treatments are designed as fuel breaks - which in many cases are equivalent to regenerating an area.

Currently about 13 percent of the LAUs in Region 1 have more than 15 percent in a stand initiation structural stage, very few due to timber harvest (Hillis et al. 2003), so the impact of the 15 percent limit would be small.

Alternative B
Under Alternative B, the 15 percent limit applies only to commercial timber sales. It does not limit prescribed fires or mechanical treatments like piling and brushing that do not produce commercial wood products.

Timber sale proceeds would not be available to offset project costs. The number of fuel treatments, including stewardship projects, could be reduced.

Alternative C
Under Alternative C, the standard becomes a guideline, Guideline VEG G6. The need to treat fuels could be cited as a rationale to deviate from the guideline. Therefore, this alternative would have a limited effect on fuel treatments.

Alternatives D & E
Under Alternatives D and E, the direction is dropped altogether, so there is no effect.

Alternative F
Under Alternative F, Standard VEG S2 would apply to all timber management projects and those fuel treatment projects that use timber harvest to achieve objectives outside the WUI as defined by HFRA. In addition, Guideline VEG G10 says to consider Standard VEG S2 in designing fuel treatment projects in the WUI.

The standard and guideline would have little to no effect on fuel treatment projects within the WUI that result in regeneration.

Generally, projects can be designed to meet the standard, but if regeneration is needed to reduce fuels then this would be an appropriate reason for deviation.

Outside the WUI, it is still likely there would be little effect because so few LAUs have more than 15 percent of an LAU regenerated by timber harvest in the last decade.

Standard VEG S3
Standard VEG S3 would require maintaining ten percent denning habitat in an LAU. Denning habitat is most common in stands with plenty of coarse woody debris, which can provide fuel for fires.

Denning habitat is likely not limiting in most of the planning area (see Chapter 2 and Lynx Section of Chapter 3 for further discussion).

Alternatives B & C
Under Alternatives B and C, Standard VEG S3 would not allow fuel treatments in denning habitat or in areas with the most potential to develop into denning habitat, when less than ten percent exists in an LAU.

At most, this standard would affect fuel treatments in ten percent of an LAU. Since it does not affect the remaining 90 percent, there is likely to be little effect.

Alternative D
Alternative D would modify Standard VEG S3 by allowing the effects of fuel treatments to be mitigated. Treatments would need to leave enough overstory trees and coarse woody debris to provide den sites.

Generally, fuel treatments could be designed to meet the standard, so it would have very limited or no effect.

Alternative E
Under Alternative E, Standard VEG S3 would not apply to fuel treatments developed through a collaborative process; therefore, it would not constrain them.

Alternative F
Under Alternative F, Standard VEG S3 is changed to Guideline VEG G11. The guideline does not require maintaining a certain percentage of denning habitat. It says to consider leaving denning habitat (such as some piles of logs) where denning habitat is limited. The guideline would not limit fuel treatment projects.

Standard VEG S4
Alternatives B & C
Under Alternatives B and C, Standard VEG S4 would in most cases prohibit salvage harvest in disturbed areas smaller than five acres. The limit does not apply to disturbed areas larger than five acres, prescribed fires, or to mechanical treatments like brushing and piling that do not produce commercial wood products.

While most fuel treatments could be designed to meet the objectives of Standard VEG S4, timber sale proceeds would not be available to offset project costs. The number of fuel treatments, including

stewardship projects, could be reduced. Otherwise, the standard would have no effect or a very limited effect.

Alternatives D & E
Under Alternatives D and E, the standard is changed to Guideline VEG G7. Retaining small patches of dead trees would have to be considered, but salvage harvest could take place when there were reasons to deviate from the guideline.

Under Alternatives D and E, projects could be designed to meet Guideline VEG G7, so the guideline would have very limited or no effect.

Alternative F
Under Alternative F Standard VEG S4 and Guideline VEG G7 are incorporated into Guideline VEG G11. Salvage harvest could occur, but if denning habitat was limiting then some dead trees or piles of logs should be left to provide denning habitat in the future. This would not limit fuel treatment projects.

Standards VEG S5 and VEG S6
Standard VEG S5 limits precommercial thinning activities that reduce winter snowshoe hare habitat in young regenerating forests; Standard VEG S6 imposes limits in multistoried forests.

Generally, young regenerating forests are not a high priority for fuel treatment. Young forests are less capable of supporting high intensity fire in stand replacing fire regimes. As these forests grow up, fuels accumulate and they become more susceptible to fires of greater intensity and magnitude and may become a priority for treatment.

Some precommercial thinning activities may occur in young forests to change species composition to those tree species less susceptible to fire, or to reduce tree density.

Multistoried forests are more likely to be a priority for fuel treatment because they generally contain trees that provide ladder fuels for fires.

Alternative B
Under Alternative B, Standards VEG S5 and VEG S6 would allow precommercial thinning - thinning the understory trees that lack commercial value - only within 200 feet of structures. Prescribed burning or commercial timber sales could be used to treat fuels.

An analysis using FIA data in Montana was used to approximate the areas of fuel treatments over the next decade that could affect winter snowshoe hare habitat (Appendix M). About 55,000 acres of NF lands could be treated for fuels in Montana winter snowshoe hare habitat during the next decade. Under Alternative B, about 76,550 acres - 29,850 acres in the WUI - could be relocated to avoid thinning in winter snowshoe hare habitat - see 3-36. However, since other treatment methods are available, the effect is likely limited.

Alternative C
Under Alternative C, Standards VEG S5 and VEG S6 would allow

vegetation management projects only for research and within 200 feet of structures.

Under Alternative C, in Montana all treatments in winter snowshoe hare habitat would have to be relocated to avoid reducing winter snowshoe hare habitat – which is estimated at about 131,000 acres.

Where Standards VEG S5 and VEG S6 preclude fuel treatment, the ability to reduce fuels and fire risk could decrease. It is unknown if the standards would restrict the ability to treat fuels in critical places – each situation would have to be evaluated at the project level.

Alternative D
Under Alternative D, Standards VEG S5 and VEG S6 would allow precommercial thinning and other vegetation management projects either to restore tree species in decline or where the amount of winter snowshoe hare habitat is greater than the historic range – see the *Forests* section later in Chapter 3. However, how many acres would be allowed is not available, and would depend on the size and number of site-specific projects.

It is possible that all treatments in winter snowshoe hare habitat would have to be relocated to avoid reducing winter snowshoe hare habitat. In Montana this is estimated at about 131,000 acres. However, it is likely some of these acres could be treated under the exemptions in Alternative D.

Where Standards VEG S5 and VEG S6 preclude fuel treatment, the ability to reduce fuels and fire risk could decrease. It is unknown if the standards would restrict the ability to treat fuels in critical places – each situation would have to be evaluated at the project level.

Alternative E
Under Alternative E, Standard VEG S5 would not apply to fuel treatments developed in a collaborative manner and Standard VEG S6 is changed to Guideline VEG

Table 3-36. Fuel treatments in Montana possibly moved to avoid hare habitat in a decade

	Alt A	Alt B	Alt C	Alt D	Alt E	Alt F
Inside WUI (46,200 acres fuel treatment projected)						
High density forests	0 acres	14,350 acres	20,500 acres	20,500 acres	0 acres	0 acres
Low density forests	*0 acres*	*15,500 acres*	*25,700 acres*	*25,700 acres*	*0 acres*	*0 acres*
Outside WUI (85,000 acres fuel treatment projected)						
High density forests	0 acres	28,000 acres	51,000 acres	51,000 acres	0 acres	51,000 acres
Low density forests	*0 acres*	*18,700 acres*	*34,000 acres*	*34,000 acres*	*0 acres*	*34,000 acres*
Total (540,000 acres)						
Total	0 acres	76,550 acres	131,200 acres	131,200 acres	0 acres	85,000 acres

It is possible some fuel treatments in low density forests would not need to be relocated because they may lack the horizontal cover needed to provide winter snowshoe hare habitat – see *Lynx* section.

Table 3-37. Acres of the 10 year hazardous fuel reduction program in lynx habitat that would be unconstrained (standards would not apply – but guidelines may)

Area	Alt A	Alt B	Alt C	Alt D	Alt E	Alt F
In WUI	284,000	>284,000	0	0	284,000	284,000
Outside WUI	597,000	>597,000	0	0	597,000	0
Total program	881,000	>881,000	0	0	881,000	284,000

S8. The need to treat fuels could be cited as a rationale to deviate from the guideline. Therefore, Standard VEG S5 and Guideline VEG G8 would have little to no effect on fuel treatments.

Alternative F
Under Alternative F, Standard VEG S5 and S6 would not apply to fuel treatments within the WUI as defined by HFRA. Guideline VEG G10 would apply, which says to design projects considering Standards VEG S5 and S6. In many cases, fuel treatments can be located to avoid reducing winter snowshoe hare habitat; however in some instances it may be necessary to remove ladder fuels, or thin vegetation. Under Alternative F there would be little to no effect on fuel treatments in the WUI.

Outside the WUI it is unknown if the standards would restrict the ability to treat fuels in critical places; each situation would have to be evaluated at the project level. It is possible effective treatment could be done instead in places that are not winter snowshoe hare habitat; however it is likely some projects would be precluded. In Montana, it is possible about 85,000 acres outside the WUI would be have to be relocated to avoid winter snowshoe hare habitat.

Effects summary

Alternative B
Alternative B constrains the amount of fuel treatment projects that result in regeneration or that use precommercial thinning as a tool in winter snowshoe hare habitat. These constraints could affect the ability to conduct some fuel treatments.

About 881,000 acres of fuel treatment projects are anticipated to occur in lynx habitat over the next decade. These projects would either meet the terms of the standards or could be designed to avoid lynx habitat components. Many projects would not be constrained in multistoried forests because precommercial thinning is the only activity prohibited. However it is still likely some hazardous fuel reduction would not occur on some portion of these areas. Alternative B may limit the ability to reduce fire size and intensity in some places.

Alternative C
Alternative C constrains the amount of fuel treatment projects that result in regeneration to a lesser degree than Alternative B, but constrains

most type of activities in winter snowshoe hare habitat.

Alternative C would likely affect the ability to conduct some fuel treatments. In many cases, fuel treatments can be designed to meet the standards, but in some situations some projects or portions of projects would not occur, especially projects that affect winter snowshoe hare habitat. Based on the management direction Alternative C is likely to limit the ability to reduce fire size and intensity.

Alternative D
Alternative D also would affect the ability to conduct fuel treatment, but to a lesser degree than Alternative C. Some standards become guidelines and more activities are allowed. It provides more options for designing fuel treatments. However, Alternative D restricts most fuel treatment activities in multistoried forests; therefore it is likely some fuel treatment projects in these areas would not occur. In some cases, Alternative D could affect the ability to reduce fire size and intensity.

Alternative E
Alternative E would allow all fuel treatments to occur; therefore the management direction would not limit the ability to reduce fire size or intensity.

Alternative F, Scenario 1
Alternative F Scenario 1 would not constrain fuel treatments in the WUI within limits. Alternative F Scenario 1 would apply the management direction to all lynx habitat in LAUs. Fuel treatment projects can only exceed the standards on six percent of lynx habitat within an administrative unit. The likelihood of exceeding this limit however is low given budgets and the anticipated program of work. Alternative F would not limit the ability to reduce fire size and intensity in the WUI.

Alternative F constrains fuel treatments outside the WUI. In many cases, fuel treatments can be designed to meet the standards, but in some situations some projects or portions of projects would not occur, especially projects that affect winter snowshoe hare habitat. In these cases Alternative F is likely to limit the ability to reduce fire size and intensity.

Alternative F, Scenario 2
Alternative F, Scenario 2, would have similar effects as described above except the management direction would not have to be applied to the Nez Perce, Salmon-Challis, Beaverhead-Deerlodge, Bitterroot, Ashley and Bighorn National Forests, and the disjunct mountain ranges on the Custer, Gallatin, Helena and Lewis and Clark NFs until these areas are occupied by lynx.

Fuel treatments would not necessarily be constrained on these units. The management direction can still be considered, but would not have to be applied while the units remain unoccupied. Fuel

treatments were projected to occur in lynx habitat over the next decade on about 32,500 acres on the Nez Perce; 49,500 acres on the Salmon-Challis; 50,000 acres on the Beaverhead-Deerlodge; 21,000 acres on the Bitterroot; and 32,400 acres on Bighorn NF. Information about fuel treatments specific to the disjunct mountains on the Gallatin, Helena and Lewis and Clark NFs is not available. About 22,000 acres on the Custer, 19,000 acres on the Gallatin, 31,200 on the Helena and 34,800 acres on the Lewis and Clark NFs were projected to occur in lynx habitat on each of the forests in their entirety (Appendix M).

It is likely some of the projects would be designed to meet lynx needs and some would not. Alternative F, Scenario 2, would not limit the ability to reduce fire size and intensity on these units and isolated mountain ranges until such time as the areas become occupied. Once occupied the effects would be the same as described in Alternative F, Scenario 1.

Cumulative effects

Fire suppression has reduced the amount fire in Rocky Mountain forests since the early 1930s. Because these forests evolved with fire, its absence has altered forest conditions and health. Changes include increases in forest cover and density, and decreases in trees that cannot tolerate shade like pines and western larch. Fuel loads are unnaturally high.

As a result, the health of some forest ecosystems is in decline, especially in the warm, dry, low-elevation forests where fire used to occur frequently. Lynx habitat does not occur in such forests.

Under the *National Fire Plan* and the *10-Year Comprehensive Strategy, the Healthy Forests Initiative* fire suppression would continue, but the Forest Service would implement fuel treatments targeting the highest risk communities and forest ecosystems. This amounts to areas close to where people live with an understory or mixed-severity fire regime.

While fire exclusion has not yet significantly altered forests that evolved with infrequent fires, landscape changes are noticeable (Keane et al. 2002). Forests with young age class trees are often missing. Fuel treatments could benefit lynx by creating young stands that would develop into high-quality winter snowshoes hare habitat.

Alternatives A and E
The National Fire Plan and Healthy Forests Initiative have identified the need to treat hazardous fuels. Other programmatic decisions listed in Appendix L have had minimal effect on ability to reduce fuels where necessary.

Alternatives B, C, D
The management direction, in addition to the past, present, and

reasonably foreseeable actions listed in Appendix L would further limit or restrict where fuel treatments could occur. This could affect the ability to treat hazardous fuels – especially adjacent to communities in some situations. Alternative B would not affect the ability to treat the fuels to the same degree as Alternatives C and D would.

Alternative F

The management direction, in addition to the past, present, and reasonably foreseeable actions listed in Appendix L would not cumulatively affect the ability to treat hazardous fuels adjacent to communities; but could further limit or restrict opportunities outside the WUI. This could affect some opportunities to modify fire patterns.

Forests

This section describes the forested environment of the planning area and the effects of the alternatives. The *Economics* section later in Chapter 3 provides more information about the economic effects, particularly about the proposed precommercial thinning restrictions. More information can be found in the Project Record.

Disturbance regimes

Wildfire

Wildfire plays a major role in determining forest structure, composition, and landscape patterns in the northern Rocky Mountains. Fire history data from the Interior Columbia Basin region shows extensive fire activity at least every decade or two between the mid-1500s and the early 1900s (Barrett et al. 1997). An estimated 12 million acres burned in the northern Rockies between 1908 and 1947 (Lotan et al. 1985). The largest known fire years since 1900 each burned from two to three million acres in the Interior Columbia Basin region (Arno, records on file, Intermountain Fire Sciences Lab, Missoula, MT).

Wildfire plays a major disturbance role in the higher elevations (Ruediger et al. 2000). Although lynx habitat typically has mixed severity to stand-replacing fire regimes, some fires are low intensity, which allow some tree species to survive fire. See the discussion in the Chapter 3 *Fire* section.

Species such as western larch, lodgepole pine, ponderosa pine, quaking aspen, western white pine, and whitebark pine have adapted to fire as a major disturbance agent (Fischer & Bradley 1987; Smith & Fischer 1997). Due to fire suppression during the last 80 years, many of these species have declined (Quigley et al. 1996).

Logging

Logging has changed the landscape in some places. Extensive salvage logging took place after mountain pine beetles killed many trees during the 1960s through the 1980s in large areas in the southern and eastern parts of the northern Rocky Mountains.

The cedar-hemlock zone in north Idaho and the larch-lodgepole forests of western Montana, also have a history of logging on the more accessible terrain.

Timber harvest in these areas has contributed to the quantity of young regenerating forests, although fire has had a much greater impact.

Stand initiation stage

A forests *structure* consists of its appearance, species composition, growth, resistance to disturbance, etc. The structure is largely set by the spatial arrangement and heights of the trees by the time they reach the stem exclusion stage (see Figure 3-2 in the *Lynx* section). Precommercial thinning generally takes place in the stand initiation stage, before stem exclusion has occurred, and sets the stage for the future.

In mixed-species forests, dominant trees in the understory often grow rapidly after thinning releases them from competition. Species that need full sun die if they become much suppressed. Thinning must be done before trees loose their crowns because severely suppressed trees may never respond (Oliver & Larson 1996).

Most precommercial thinning occurs on lands in the suitable timber base. Historically, trees were thinned to a uniform spacing to improve growth and yield of future wood products.

The management objectives for the suitable time base have been broadened to include ecosystem and restoration purposes (USDA FS 1997b). Today, precommercial thinning using variable spacing is commonly used to promote structural and compositional diversity and to promote the historic representation of forest cover types.

Daylight thinning
Daylight thinning is a modified version of precommercial thinning that could preserve most of the forage and still provide relief from crowding for trees that need full sun. *Daylight thinning* would remove no more than 20 percent of the small trees and shrubs that provide winter snowshoe hare habitat. An area from eight to 20 feet in diameter would be cleared around the best performing trees; no trees or shrubs would be removed outside the cleared area.

- If eight-foot-diameter clearings were used, about 150 trees per acre could be released
- If 20-foot-diameter clearings were used, less than 30 trees per acre would be released

Western white pine
Western white pine *(Pinus monticola)* grows in the moist forests in northern Idaho and western Montana. This tree has been in major decline over the past 60 years.

The proportion of western white pine declined from 44 percent in 1941 to five percent in 1979 (Graham 1990). Since the 1930s, more than 95 percent of western white pine cover types have converted to grand fir, Douglas fir, or western red cedar/western hemlock (USDA FS 1998). Only about 90,000 acres in north Idaho and western Montana still exist in the western white pine cover type, according to Forest Inventory and Assessment data.

Western white pine blister rust (*Cronartium ribicola*) spread to the Pacific Northwest from Europe by the 1920s (Graham et al. 1993) and killed many trees in northern Idaho. Naturally occurring

rust-resistant wild trees were discovered in the 1940s; genetic resistance is carried in a low percentage of the population. It is the intent of selection to increase the frequency of resistant genes in western white pine planting stock (Byler et al. 1993). As such, rust-resistant trees are an important part of the genetic resource program.

Fire suppression and logging changed the distribution of western white pine. In pre-settlement times, low- and intermediate-intensity burns produced an irregular, patchy mosaic of vegetation. Fires frequently shortened how long the dense stem-exclusion stages lasted by thinning them and breaking holes in uniform canopies (Zack & Morgan 1994).

Western white pine is well adapted to mixed-severity fire regimes. In fact, it depends on the disturbance fire or timber harvest provides to remove competing conifers and allow it to become established (Graham 1990). Its relatively thin bark and moderately flammable foliage make it intermediate in fire resistance (Graham 1990). In the past, fire removed the competing conifers (Graham 1990).

Restoring western white pine
Restoring western white pine involves planting trees that can resist blister rust and thinning them (USDA FS 1998). About 96,000 acres were planted in FS Region 1 to rust-resistant western white pine between 1973 and 2001.

Neither natural forests nor plantations of western white pine respond well to thinning after they are 30 years old (Graham et al. 1993). Precommercial thinning reduces the probability of insect and disease attacks and stand-replacing fires by removing shade-tolerant trees.

About 70,700 acres of western white pine are scheduled for precommercial thinning during the next decade; 51,090 acres are in lynx habitat. See 3-38.

The thinning would help the planted trees survive and give them a competitive advantage over competing trees, without relying on other disturbances. The seed source of these rust-resistant trees represent is vital to the future of western white pine forests on the landscape.

Alternative A, the no action alternative
Precommercial thinning would continue, allowing planted rust-resistant western white pine to successfully compete with shade-tolerant trees. About 70,700 acres could be precommercially thinned. This amounts to almost 75 percent of the western white pine planted during the last 20 years. The no-action alternative would contribute to restoring this species.

Even if full funding is not received, these acres are the number one priority for thinning in FS Region 1; therefore, it is likely all 70,700 acres of thinning scheduled in planted western white pine would occur.

Table 3-38. Planted western white pine precommercial thinning scheduled next decade

	Inside lynx habitat	Outside lynx habitat	Total
Western white pine	51,090 acres	19,610 acres	70,700 acres

Alternatives B, C & E
Alternatives B, C, and E would defer precommercial thinning on 51,090 acres inside lynx habitat. It is likely the western white pine seedlings planted would not reach maturity unless something disturbs the plantations, because the species can not compete without disturbance.

Western white pine does not respond to delayed thinning, after the forest no longer provides winter snowshoe hare habitat and the trees are 45 years old. The likely result of Alternatives B, C, and E would be the loss of white pine on more than 70 percent of these planted acres, the species' continued decline and the loss of most of the investment in these plantations.

Alternatives D & F Scenario 1
Under Alternatives D and F Scenario 1, daylight thinning could be used to restore planted western white pine while retaining winter snowshoe hare habitat. Alternative F Scenario 1 would apply the management direction to all lynx habitat in LAUs. The investments in rust-resistant trees could be protected on the 51,090 acres in lynx habitat.

Generally, trees were planted at a density of 300 per acre. Using daylight thinning, depending on the spacing, from about 150 to less than 30 trees per acre would be protected.

This restricted approach to thinning would not release all the planted trees from competition and may not be the ideal approach to restore this species, but some would survive into maturity and produce rust-resistant seed, resulting in future generations of rust-resistant trees.

Alternatives D and F are likely to maintain and restore western white pine.

Alternative F Scenario 2
Under Alternative F, Scenario 2, the management direction would not have to be applied to the Nez Perce, Salmon-Challis, Beaverhead-Deerlodge, Bitterroot, Ashley and Bighorn NFs, and the disjunct mountain ranges on the Custer, Gallatin, Helena and Lewis and Clark NFs until these areas are occupied by lynx. No precommercial thinning to restore western white pine is projected to occur on any of these units. These units are outside the range of western white pine; therefore there would no difference in effect to western white pine.

Whitebark pine
Whitebark pine (*Pinus albicaulis*) is a hardy subalpine conifer that tolerates poor soils, steep slopes, and windy exposures. It grows at higher elevations across much of the northern Rockies.

Currently, whitebark pine is found mainly at the timberline. It is a component of many habitat types and is distributed across a variety of site conditions in the planning area.

In lynx habitat, whitebark pine is found in productive places where it grows densely with western white pine, spruce, and fir. It also grows in sparse clusters on harsh, rocky places in the upper subalpine zone. Harsh whitebark pine sites do not support the stem densities capable of supporting hare populations and are not considered lynx habitat.

Whitebark pine is hardier than other conifers and can become established on

dry, cold subalpine sites. It is a relatively slow growing tree and can be out-competed for growing space by conifers that are more shade tolerant. Where it competes with other species that need full sun, whitebark pine is often able to maintain its presence (Tomback et al. 2001).

Historically, whitebark pine accounted for ten to 15 percent of the forest cover in the northern Rocky Mountains (Arno & Weaver 1990); now it amounts to only about five percent. In the planning area, about 1.5 million acres are in the whitebark pine cover type. Blister rust and fire suppression have substantially reduced its presence. Epidemics of mountain pine beetles have further reduced isolated populations.

Historically, mixed severity fires maintained whitebark pine at high elevations by removing competing species. Without fire, whitebark pine is eventually replaced by subalpine fir and spruce. The long-term consequence of keeping fire out is changing the fire regime from mixed severity to stand-replacing (Arno & Hoff 1990; Keanne et al. 2002).

Restoring whitebark pine

Restoring historic fire regimes at the landscape level would be the most successful restoration technique for whitebark pine (Tomback et al. 2001; Keane et al. 2000; Arno pers. com.). Indeed, the viability of the species may depend on broad-scale landscape solutions (Keane et al. 2000). In national parks and wilderness areas where larger landscape fires may be manage for resource benefits, both prescribed fire and silviculture practices can be used (Tomback et al. 2001). Prescribed fire has been used experimentally to restore whitebark pine on a small scale.

In a practical sense, restoring a historic fire regime throughout the range of whitebark pine would be difficult. Silvicultural treatments that imitate the effects of a mixed fire regime, primarily thinning and precommercial thinning in subalpine fir habitat types, are recommended (Tomback et al. 2001; Arno pers. com.). Thinning out understory shade-tolerant trees is one alternative to fire that can create openings in the forest canopy and imitate the results of the low- and mid-intensity fires. Precommercial thinning combined with fire, followed by planting blister-rust resistant seedlings, may be the best way to restore these communities (Tomback et al 2001).

When a new whitebark pine stand grows up after fire, it may be overly dense and need thinning. Thinning whitebark pine is not recommended in places that are at high risk for blister rust because the disease may attack and kill nonresistant trees (Tomback et al 2001). It is also possible that thinning the competing conifers and shrubs could create habitat

Table 3-39. Whitebark pine precommercial thinning scheduled next decade

	Inside lynx habitat	Outside lynx habitat	Total
Whitebark pine	9,110 acres	250 acres	9,360 acres

for the alternate host of blister rust, although forest openings that receive less than 80 to 90 percent full sunlight would generally not support the alternate host (Tomback et al. 2001).

About 9,110 of the 9,360 acres of the precommercial thinning in whitebark pine scheduled for the next decade are in lynx habitat (see Table 3-39). Another 51,000 acres in lynx habitat are planned for prescribed fire without thinning. Some of these acres are likely winter snowshoe hare habitat.

Alternative A, the no action alternative
Precommercial thinning that favors whitebark pine may take place during the next decade on 9,360 acres under the no-action alternative if fully funded. Most of this thinning is in lynx habitat. The no-action alternative would allow precommercial thinning and other restoration activities like prescribed fire to help maintain and restore whitebark pine.

Alternatives B & C
Alternatives B and C would defer precommercial thinning in lynx habitat until the forests self-pruned above the reach of snowshoe hares. These alternatives would result in the continued decline of whitebark pine on 9,110 acres in lynx habitat. Some decline would likely continue anyway unless full funding was received, and there is no guarantee of that.

Under Alternative B, other restoration activities such as prescribed fire could still take place to help whitebark pine.

Under Alternative C, Standards VEG S5 and VEG S6 would preclude using prescribed fire in winter snowshoe hare habitat, leaving no tools except wildfire to restore whitebark pine, resulting in an even greater decline.

Alternatives D, E & F Scenario 1
Alternatives D and F Scenario 1 would allow using whatever methods are needed to restore and maintain whitebark pine. Alternative F Scenario 1 would apply the management direction to all lynx habitat in LAUs. Alternative E would allow projects that restore fire-adapted ecosystems to restore whitebark pine.

Restoring whitebark pine forests could involve removing competing vegetation and returning fire to the landscape. Removing competing vegetation would improve the vigor and growth of individual trees, improving its ability to survive future fires and produce seed to regenerate naturally.

Assuming full funding, about 9,110 acres of whitebark forests in lynx habitat could be precommercially thinned in the next decade.

Alternative F Scenario 2
Under Alternative F, Scenario 2, the management direction would not have to be applied to the Nez Perce, Salmon-Challis, Beaverhead-Deerlodge, Bitterroot, Ashley and Bighorn NFs, and the disjunct mountain ranges on the Custer, Gallatin, Helena and Lewis and Clark NFs until these areas are occupied by lynx. Precommercial thinning to restore whitebark pine in lynx habitat is projected to occur on about 300 acres of the Salmon-Challis NF; 1,000 acres on the Gallatin; 500 acres on the Helena; 1,000 acres on the Custer. Regardless of which scenario is applied, precommercial thinning to

restore whitebark pine would be allowed; therefore there would be no difference in effect to whitebark pine.

Quaking aspen

Quaking aspen *(Populus tremuloides)* is a species that needs full sun that commonly grows in even-aged forests. Aspen is distributed throughout the northern Rockies in small, isolated areas. It is more extensive east of the Continental Divide in Montana and in the southern half of the planning area in Wyoming and Utah (Mueggler 1985). About 500,000 acres of aspen grow in the planning area, according to FIA data.

Some single-storied aspen forests have two distinct generations, consisting of a more or less substantial scattering of old veterans that stand among younger, more slender trees. The older trees usually are the survivors of fire a decade or more earlier that killed much of the stand and gave rise to the younger trees. Many of the younger trees grow as tall as the older ones, and with them, form a closed canopy (Jones & DeByle 1985).

Conifers growing beneath aspen are generally younger than the aspen because aspen regenerates so quickly from existing roots (Sheppard & Jones 1985). Many aspen forests are threatened with invasion by shade-tolerant conifers. From 50 to 70 percent of the quaking aspen in FS Region 1 has been lost because of fire suppression and grazing (USDA FS 1998). Grass, forbs, shrubs, or conifers may replace aspen in the absence of fire (Jones & DeByle 1985).

Fire has been the most important disturbance factor in aspen, changing structural stages and composition and minimizing competition by conifers. If fire takes place infrequently (every 50 years or so) and is intense enough to kill most or all of the aspen trees and the competing conifers, aspen is retained (Jones & DeByle 1985).

Mixed-severity fires where aspen grow at mid- and high elevations historically regenerated aspen and maintained the balance between aspen and conifers. Severe or repeated burns may reduce site quality, resulting in reduced growth rates.

Restoring quaking aspen

Silvicultural treatments at the stand scale have been too small to effectively maintain quaking aspen at the landscape scale (USDA FS 1998). Without fire, human intervention appears to be necessary for the continued well-being of aspen (Jones and DeByle 1985).

Precommercial thinning to restore aspen is scheduled in 6,120 acres of young forests during the next decade; 3,050 acres are in lynx habitat (see Table 3-40).

Alternative A, the no action alternative

When conifers compete with aspen, precommercial thinning can lengthen the time aspen has a competitive advantage. If fully funded, precommercial thinning may take place on 3,050 acres in lynx

Table 3-40. Quaking aspen precommercial thinning scheduled next decade

	Inside lynx habitat	Outside lynx habitat	Total
Quaking aspen	3,050 acres	3,070 acres	6,120 acres

habitat, so aspen could be retained.

Alternatives B, C & E
Alternatives B, C, and E would not allow precommercial thinning in lynx habitat until forests have self-pruned above the reach of snowshoe hares. Precommercial thinning would be deferred on about 3,050 acres in lynx habitat. Some precommercial thinning may be allowed under Alternative E if the purpose is to restore fire-adapted ecosystems.

Conifer encroachment would result in reducing aspen dominance. This would reduce the likelihood aspen would be able to regenerate from root suckering and dominate future generations by overwhelming a site with suckers.

Although the alternatives do not affect many acres, without the compensating results of returning fire to the landscape, aspen would likely continue its decline and become an even smaller part of the ecosystem.

Alternatives D & F Scenario 1
Alternatives D and F Scenario 1would allow precommercial thinning to restore aspen. Conifers would be removed, so aspen can establish a healthy root system capable of suckering or sprouting when the stand is next disturbed by fire or harvest. Thinning would give it a competitive advantage and encourage it as hare forage.

Aspen forests may be maintained and restored on up to 3,050 acres in lynx habitat if fully funded.

Alternative F Scenario 2
Under Alternative F, Scenario 2, the management direction would not have to be applied to the Nez Perce, Salmon-Challis, Beaverhead-Deerlodge, Bitterroot, Ashley and Bighorn National Forests, and the disjunct mountain ranges on the Custer, Gallatin, Helena and Lewis and Clark NFs until these areas are occupied by lynx. Precommercial thinning to restore aspen in lynx habitat is projected to occur on about 1,100 acres of the Salmon-Challis NF; 220 acres of the Beaverhead-Deerlodge NF; 390 acres of the Ashley NF; 90 acres of the Bighorn NF; 30 acres on the Gallatin; and 190 acres on the Helena NF. Regardless of which scenario is applied, precommercial thinning to restore aspen would be allowed; therefore there would be no difference in effect to aspen.

Western larch
Western larch *(Larix occidentalis)* is found in northern Idaho and western Montana. Larch grows in diverse habitats, ranging from moist Douglas fir and grand fir, western red cedar and western hemlock, to cooler subalpine fir sites.

Larch is the conifer species that most needs full sun in the northern Rockies. It regenerates in full sunlight and large openings after major disturbance. To survive, larch must maintain a dominant position in the stand. If overtopped by other trees, larch growth would slow and the trees usually die (Fielder & Lloyd 1995).

Larch is extremely well adapted to fire. Mature larch have bark that is often more than six inches thick, containing little resin, with branches far above the ground and foliage of low flammability.

Larch is able to tolerate crown scorch and defoliation, producing new foliage and re-branching on the trunk. At least some of the old larch usually survives even intense fires, at least long enough to produce a seed crop to regenerate the stand where there are receptive seedbeds (Schmidt & Shearer 1995).

Even young larch wounded at the base of the stem in a surface fire, heal and continue to grow for centuries. On burned seedbeds, larch seedlings generally outgrow their competitors (Arno & Fischer 1995).

Historically, fire maintained larch (Schmidt & Shearer 1995). Stand-replacing fires burned moist larch sites at mean intervals of from 120 to 350 years. Low- to intermediate-intensity fires favored larch by thinning out much of the competition (Arno & Fischer 1995; Carlson et al. 1995).

After fire, a residual cover of 20 percent or fewer large trees was common historically (Quigley et al. 1996). This structure of large residual trees, occurring singly or in small groups, has declined in many areas. The big larch has been logged out in many places.

In most places lacking fire or thinning, trees that are more shade-tolerant can replace larch in 90 to 140 years. With fire or thinning, larch can maintain dominance for 200 years or more.

Western larch has declined in the northern Rockies because of fire suppression and logging (USDA FS 1998). Tree species composition has shifted to shade-tolerant Douglas fir, grand fir, and lodgepole pine. Because of the shift, current fire-return intervals are longer than 100 years and fire behavior is more extreme, rather than the combination of fires that favored larch (USDA FS 1998).

Restoring western larch
Much of the remaining young larch is too dense to survive to maturity (USDA FS 1998). Restoring western larch includes precommercial thinning to maintain its competitive advantage and insure progress into mature trees that can help areas naturally regenerate after fire.

Precommercial thinning is an important approach to help restore western larch and is scheduled on 168,440 acres of young forests during the next decade; 123,160 acres are in lynx habitat (see Table 3-41).

Alternative A, the no action alternative
The no-action alternative would continue the current precommercial thinning program, increasing the probability of developing a structural component of old-growth larch that can survive fire to regenerate future forests. If fully funded, precommercial thinning may take place on up to 123,160 acres in lynx habitat.

Many larch plantations lack an overstory. Without thinning, they may never develop into mature trees that can survive fire. The no-action alternative would

Table 3-41. Western larch precommercial thinning scheduled next decade

	Inside lynx habitat	Outside lynx habitat	Total
Western larch	123,160 acres	45,280 acres	168,440 acres

maintain larch on the landscape by imitating natural disturbance processes.

Alternatives B, C, E & F Scenario 1
These alternatives would restrict precommercial thinning in all lynx habitat in LAUs until the forests no longer provide winter snowshoe hare forage, and larch likely would continue to decline there.

Many of these forests lack the mature, fire-resistant trees capable of reseeding burned landscapes consistent with historic patterns. Since large trees are missing, without extensive fire and expensive artificial regeneration, larch likely would continue to decline on about 123,160 acres in lynx habitat.

Some thinning may be allowed under Alternatives E and F if the purpose is to restore fire to the ecosystem.

Alternative D
Alternative D would permit daylight thinning, retaining up to 80 percent of the winter snowshoe hare habitat. Thinning would release young larch from suppression, so large trees could develop, survive fire, and re-seed future forests.

Trees would be selected based on which are the healthiest larch. To retain 80 percent of the cover, about 20 trees per acre could be daylight thinned to a radius of 12 feet.

This restricted approach to thinning would help return the competitive advantage to this fire-resistant species that needs full sun. Daylight thinning would not protect all the trees and may not the be the ideal approach to restore this species, but some would survive into maturity and produce seed, resulting in future generations and resulting in long-lived snags. Alternative D would help maintain this species on the landscape.

Daylight thinning in lynx habitat would provide enough trees to perpetuate the species through natural regeneration after stand-replacing fire. If fully funded, about 123,160 acres of larch could be thinned in lynx habitat.

Alternative F Scenario 2
Under Alternative F, Scenario 2, the management direction would not have to be applied to the Nez Perce, Salmon-Challis, Beaverhead-Deerlodge, Bitterroot, Ashley and Bighorn NFs, and the disjunct mountain ranges on the Custer, Gallatin, Helena and Lewis and Clark NFs until these areas are occupied by lynx. Precommercial thinning to restore larch in lynx habitat is projected to occur on 120 acres on the Nez Perce NF and 190 acres on the Helena NF. Under Alternative F Scenario 2, this thinning could go forward, unless the areas become occupied. This minor amount of precommercial thinning for western larch would have little effect in restoring the species since only 310 acres of the 123,160 acres in lynx habitat could be treated.

Ponderosa pine
Ponderosa pine *(Pinus ponderosa)* is not significantly represented in lynx habitat in the northern Rockies. Generally, it grows in places too dry to support snowshoe hare and lynx; however, it is represented in lynx habitat in the warm, moist cedar forests of northern Idaho and western Montana.

Fire has played a major role in cedar forests with ponderosa pine. The diverse species and structures indicate pre-settlement fire patterns were highly variable. Shorter fire-return intervals likely favored ponderosa pine. Most cedar forests experienced mixed-severity fire. The ponderosa pines were able to survive some stand-replacing fires (Smith & Fischer 1997).

In most of lynx habitat, shade-tolerant trees out-compete ponderosa pine without some disturbance that reduces stem densities. Even if fire were returned to these ecosystems, the younger ponderosa pine would need to be thinned out for them to grow large enough to be able to endure fire. In many places, timber harvest has removed the large pines. In other places, the big trees are so stressed from high understory stem densities that needle diseases and bark beetles are killing them at high rates.

Historically, ponderosa pine forests developed because frequent low-intensity surface fires killed the competing conifers and prepared a seedbed for the pine (Steele 1987). Low-intensity fires helped maintain them because sapling and larger ponderosa pine are more fire resistant than most other species (Oliver & Ryker 1990; Saveland & Bunting 1987).

Restoring ponderosa pine
The small, low-intensity fires are no longer occurring. Instead, even-aged harvest and the changes in wildfire during the last 80 years, mean that more disturbances would be needed to maintain ponderosa pine as a major component.

With full funding, 11,660 acres of ponderosa pine could be precommercially thinning during the next decade in lynx habitat (see Table 3-42).

Alternative A, the no action alternative
The no-action alternative would help maintain ponderosa pine forests in lynx habitat, resulting in more-resilient ecosystems because they would contain fire-adapted species. About 11,660 acres of ponderosa pine in lynx habitat would be precommercially thinned under the no-action alternative if fully funded.

Alternatives B, C, E & F Scenario 1
These alternatives would restrict precommercial thinning in all lynx habitat in LAUs. Ponderosa pine is both more shade-tolerant than larch and less fire resistant. Restricting precommercial thinning would have a similar effect to what is described for western larch, but on fewer acres. Some thinning may be allowed under Alternatives E and F if the purpose is to restore fire to the ecosystem.

Alternative D
Alternative D would allow daylight thinning in ponderosa pine, retaining about 80 percent of the winter snowshoe hare habitat. The ecological effects are similar to Alternative D for western larch.

About 11,660 acres would be thinned, giving the pine a chance to grow large

Table 3-42. Ponderosa pine precommercial thinning scheduled next decade

	Inside lynx habitat	Outside lynx habitat	Total
Ponderosa pine	11,660 acres	48,450 acres	60,110 acres

enough to survive fire. This restricted approach would not protect all the trees and may not be the ideal approach, but some would survive into maturity and produce seed, resulting in future generations. Alternative D would help maintain this species on the landscape.

Alternative F Scenario 2
Under Alternative F, Scenario 2, the management direction would not have to be applied to the Nez Perce, Salmon-Challis, Beaverhead-Deerlodge, Bitterroot, Ashley and Bighorn NFs, and the disjunct mountain ranges on the Custer, Gallatin, Helena and Lewis and Clark NFs until these areas are occupied by lynx.

Precommercial thinning to restore ponderosa pine in lynx habitat is projected to occur on 120 acres on the Nez Perce NF; 100 acres on the Bitterroot NF; 2,200 acres on the Salmon-Challis NF; and 90 acres on the Bighorn NF. Under Alternative F Scenario 2, this thinning could go forward, unless the areas become occupied. Precommercial thinning could go forward on about 2,500 acres in lynx habitat, which would help maintain the ponderosa pine component in these forests. If the areas become occupied at a future time, then the effects on these units would be the same as Alternative F, Scenario 1, described in the previous sections.

Lodgepole pine
Lodgepole pine *(Pinus contorta)* is the main cover type on about seven million acres in the planning area. Extensive landscapes of near-pure lodgepole or lodgepole/spruce/fir are common in the eastern and southern half of the planning area. Lodgepole pine grows larger and mixes readily with western larch, grand fir, and western white pine on moister sites in the northern and western portion of the planning areas.

Lodgepole is a short-lived tree in western Montana and northern Idaho, and long-lived in eastern Montana and the central Rocky Mountains. Lodgepole is fire-adapted, establishing itself on burned areas (Lotan et al. 1985). Stocking can be as high as 10,000 to 40,000 stems per acre. Most lodgepole forests in the Rocky Mountains were established because of fire.

Historically, fire burned more frequently in lodgepole pine than previously believed. It used to be considered that lodgepole forests were merely the result of stand-replacing fires, but research has shown fire-free intervals of only 22 to 50 years in many lodgepole-dominated forests (Lotan et al. 1985), suggesting fire reduced stand densities. This indicates fire plays a role in both establishing and perpetuating lodgepole pine.

The effects of low-intensity fires in lodgepole forests depend on the availability of seed and amount of duff removed. These low-intensity fires removed some trees, allowing others to grow into large trees. Without some disturbance, lodgepole forests become quite dense with small-diameter stems, small crowns, and little diversity.

Except for extensive timber harvests in eastern Montana in the 1950s and 1960s, and mountain pine beetle salvage harvests in the southeast part of the planning area in the 1970s and 1980s, fire suppression

has resulted in extensive areas of mature lodgepole.

Much of it is susceptible to infestation by mountain pine beetles. Large-scale infestations result in conditions favorable to stand-replacing wildfires or succession to shade-tolerant species (USDA FS 1998).

Restoring lodgepole pine old growth
Precommercially thinning young lodgepole has a dramatic effect on their ability to grow to large diameters (Lotan & Perry 1983). Differences of from four to six inches in diameter were observed by the time the trees were 90 years old, depending on whether there were 500 trees per acre or 2,500.

Studies have shown that unless lodgepole is released from suppression when very young, stagnant growth persists after reductions in density. High stand densities reduced crown diameters and changed the distribution of foliage (Bassman 1984). In some situations, precommercial thinning is necessary to grow merchantable trees.

To provide old growth stand conditions, lodgepole requires disturbance to reduce stem densities. About 35,000 acres of lodgepole pine have been scheduled for precommercial thinning to provide for future old growth in lynx habitat (see Table 3-43).

Alternative A, the no action alternative
Although not an exact substitute, precommercial thinning can have results similar to low-intensity fires. Alternative A would continue precommercial thinning to develop old-growth lodgepole pine, and improve sawtimber yields and product value on up to 34,550 acres in lynx habitat if fully funded.

Alternatives B, C, E & F Scenario 1
Alternatives B, C, E and F would defer precommercial thinning on 34,550 acres in lodgepole forests in all lynx habitat in LAUs, until the forests no longer provide winter snowshoe hare forage.

Generally, precommercial thinning would be deferred until the trees are about 45 years old. Allowing high stem densities to persist beyond 45 years can result in thick forests, with little diversity, producing a landscape out of equilibrium after stand-replacing fire (Shaw 2002).

Delaying thinning until the trees are 45 years old results in tall, skinny trees, with little or no live crown, meaning they have little or no capacity to grow. If they are thinned after age 45, they are easily damaged or felled by snow and wind, and heavy fuel loads result.

Delaying thinning also allows mountain pine beetles to become active earlier in the larger trees, shifting stand structure away from goshawk nesting habitat (Shaw 2002). Any future economic benefits of thinning would not be realized in lynx habitat.

Table 3-43. Lodgepole pine precommercial thinning scheduled next decade

	Inside lynx habitat	Outside lynx habitat	Total
Lodgepole pine	34,550 acres	6,420 acres	40,970 acres

Alternative D
Alternative D would allow precommercial thinning to provide future old growth conditions on up to 34,550 acres in the planning area, if fully funded. Thinning would help add structural diversity to these forests and landscapes.

Alternative F Scenario 2
Under Alternative F, Scenario 2, the management direction would not have to be applied to the Nez Perce, Salmon-Challis, Beaverhead-Deerlodge, Bitterroot, Ashley and Bighorn NFs, and the disjunct mountain ranges on the Custer, Gallatin, Helena and Lewis and Clark NFs until these areas are occupied by lynx.

Precommercial thinning to restore lodgepole pine in lynx habitat is projected to occur on 21,020 acres on the Beaverhead-Deerlodge NF and 2,200 acres on the Salmon-Challis NF. Under Alternative F Scenario 2, this thinning could go forward, unless the areas become occupied. Precommercial thinning could go forward on about 23,220 acres in lynx habitat, which would help maintain the lodgepole pine component in these forests. If the areas become occupied at a future time, then the effects on these units would be the same as Alternative F, Scenario 1, described in the previous sections.

Research program
About 1,450 acres would be thinned to complete research studies in lynx habitat if fully funded during the next decade (3-44). Most of this research is designed to understand the effects of various thinning methods on tree composition and growth and its effect on wildlife, such as how snowshoe hares respond to various thinning methods.

Genetic resource program
About 220 acres of the 540 acres of genetic test sites are inside lynx habitat (see Table 3-44). Genetic test sites are plantations established to determine the genetic worth of particular trees for future breeding programs (Howe et al. 1996). The plantations are thinned after the test trees begin to compete with one another.

Alternative A, the no action alternative
Using precommercial thinning for various research objectives would continue on 1,530 acres if fully funded; 1,450 acres are inside lynx habitat. Research objectives, such as spacing trials on timber productivity, effects on snowshoe hare populations, and effects on other wildlife, would be met.

Under Alternative A, long-term genetic tests would continue to be implemented according to Regional Tree Improvement Plans on about 540 acres; 220 acres are in lynx habitat.

Alternative B for research
Alternative B would not allow precommercial thinning for research needs. Eliminating research in lynx habitat could prevent us from

Table 3-44. Research & genetics precommercial thinning next decade at full funding

	Inside lynx habitat	Outside lynx habitat	Total
Research	1,450 acres	80 acres	1,530 acres
Genetic tests	220 acres	320 acres	540 acres

understanding more fully the effects of different precommercial thinning prescriptions on winter snowshoe hare habitat.

Alternative B also would not allow precommercial thinning for genetic tests on the 220 acres in lynx habitat. Although not a large part of the precommercial thinning program, the tests and trials are important in the development of improved planting stock. Restricting precommercial thinning would eliminate the potential to implement established research, designed to evaluate the genetic material in the appropriate environment.

Alternatives C, D, E & F Scenario 1
Alternatives C, D, E and F would allow precommercial thinning for research needs and for long-term genetic tests; therefore, the effects would be the same as Alternative A.

Alternative F Scenario 2
Under Alternative F, Scenario 2, the management direction would not have to be applied to the Nez Perce, Salmon-Challis, Beaverhead-Deerlodge, Bitterroot,

Table 3-45. Scheduled precommercial thinning allowed by alternative next decade

Precommercial thinning	Alt. A	Alt. B	Alt. C	Alt. D	Alt. E	Alt F
Total at historic average funding [1]	*193,530*	*61,450*	*62,470*	*148,420*	*62,470*	*82,880*
Total at full funding	576,220	183,080	184,750	417,370 [2]	184,750	248,000
Research	1,530	80	1,530	1,530	1,530	1,530
Genetic tests	540	320	540	540	540	540
Within 200 feet of dwellings	6,360	6,360	6,360	6,360	6,360	6,360
Restoration [3]	355,700	123,080	123,080	355,700	123,080	186,330
Planted western white pine	70,700 [4]	19,610	19,610	70,700	19,610	70,700
Whitebark pine	9,360	250	250	9,360	250	9,360
Aspen	6,120	3,070	3,070	6,120	3,070	6,120
Western larch	168,440	45,280	45,280	168,440	45,280	45,280
Ponderosa pine	60,110	48,450	48,450	60,110	48,450	48,450
Lodgepole pine	40,970 [5]	6,420	6,420	40,970	6,420	6,420

Acres are those scheduled during the next decade in the planning area; actual acres could change.
[1] *All other figures are based on full funding – assumes historic average 34 percent of program request* – see the *Economics* section, Table K-6 in Appendix K & the vegetation section of the Project Record
[2] The figure for Alternative D does not include what might be allowed if a broad-scale assessment found winter snowshoe hare forage conditions exceed the historic range.
[3] Restoration = western white pine + whitebark pine + aspen + larch + ponderosa pine + lodgepole, both inside & outside lynx habitat if fully funded
[4] The figure for Alternative A represents only the planted rust-resistant western white pine scheduled to avoid loss of competitive advantage to competition from shade-tolerant trees. Total scheduled western white pine thinning is more than 70,700 acres.
[5] The figure for Alternative A represents only those lodgepole pine forests where thinning would be used to encourage old growth. Total scheduled lodgepole pine thinning is greater than 40,970 acres.

Tables K-1 through K-6 in Appendix K show thinning data by unit.

Ashley and Bighorn NFs, and the disjunct mountain ranges on the Custer, Gallatin, Helena and Lewis and Clark NFs until these areas are occupied by lynx. Regardless of which scenario is applied (Alternative F, Scenario 1 or 2), precommercial thinning to for research and genetic tests would be allowed; therefore there would be no difference in effect.

Summary of precommercial thinning in the stand initiation stage

A variety of vegetation management projects may take place during the stand initiation phase. These projects may or may not reduce winter snowshoe hare habitat, depending on how much vegetation is removed and when it is done.

Some projects do not reduce winter snowshoe hare habitat because they remove little cover or take place when the trees are not considered foraging habitat. Such activities include pruning western white pine to control blister rust, weed and release, cutting Christmas trees, and digging landscaping trees for transplant. Since these activities are very limited in scope and either have limited effects or may be modified to limit their effects, they are not discussed further in this EIS. Project Record, Forests section provides additional detail.

Precommercial thinning generally does remove winter snowshoe hare habitat. Thinning takes place in thick stands when the trees have grown taller than the average winter snow depth, when they are providing winter snowshoe hare habitat.

About 576,000 acres of precommercial thinning is scheduled to be thinned during the next decade in the planning area (see Tables 3-45 on previous page and 3-46 on next page). Of that, about 395,000 acres or about two-thirds are inside lynx habitat.

There is no guarantee of full funding. On the average in recent years, funding was received to thin only about 20,000 acres per year in the planning area (see Tables 3-45 and 3-46). Funding reductions affect all acres, not just those scheduled inside lynx habitat. See the *Economics* section later in Chapter 3 and Table K-6 in Appendix K for a discussion of historic average funding.

Effects in the stand initiation stage

Precommercial thinning is the primary vegetation management activity in the stand initiation stage. It can be done to restore and perpetuate rust-resistant western white pine, whitebark pine, aspen, western larch, ponderosa pine, and old growth lodgepole pine in the absence of wildfire or other disturbances.

Standard VEG S5 would defer precommercial thinning in winter snowshoe hare habitat in the stand initiation stage. Most, if not all of the precommercial thinning program is scheduled in these young regenerating forests.

Standard VEG S6 would also defer precommercial thinning; however, VEG S6 focuses on lynx habitat in multistoried stages. Very little, if any precommercial

thinning is scheduled in multistoried stages; therefore, the effects of this standard would be limited and it is not discussed further in this section.

Alternative A, the no action alternative

Under Alternative A, the scheduled precommercial thinning program would not be affected. If full funding were available, up to 576,220 acres of thinning could take place in the planning area during the next decade; 395,330 acres are in lynx habitat. If the precommercial thinning program were funded similar to historic average levels, up to 193,530 acres may take place during the next decade (see Table 3-46).

Alternative A would allow using precommercial thinning to restore up to 355,700 acres of species in decline to help retain them on the landscape. Thinning trees in dense young stands results in improved health and vigor (Oliver & Larson 1996). Growth would be concentrated on selected trees that have desired characteristics and future value would be improved where commercial harvest is desired. More trees would grow into large mature trees, especially in areas where fire is suppressed.

Alternative B

Under Alternative B, Standard VEG S5 would defer precommercial thinning in winter snowshoe hare habitat in the stand initiation stage, allowing thinning within only 200 feet of administrative sites, dwellings, and outbuildings to create a space defensible from fire. This means that precommercial thinning, other than adjacent to structures, would not take place until after the trees are 45 years old, and in most cases, would not take place at all.

This standard would result in deferring about 68 percent of the scheduled precommercial thinning, leaving 180,890 acres available during the next decade mostly outside lynx habitat. Under the historic average funding, about 61,950 acres would be precommercially thinned during the next decade (see Table 3-46). Research and genetic tests on 1,670 acres would not take place.

If fully funded, restoration thinning on up to 232,620 acres in lynx habitat would be forgone. The delay until young forests no longer serve as winter snowshoe hare habitat has long-lasting consequences to species that need full sun and are not able to tolerate dense stocking without a significant loss in live crown.

Without reducing stem densities, the ability to keep these species well represented would be seriously impacted. The impact is greatest on planted rust-resistant western white pine, the number one priority for thinning in FS Region 1,

Table 3-46. Alternatives A & B precommercial thinning next decade

	PCT inside lynx habitat	PCT outside lynx habitat	Total if fully funded	Historic average funding
Alternative A	395,330 acres	180,890 acres	576,220 acres	193,530 acres
Alternative B	2,190 acres	180,890 acres	183,080 acres	61,950 acres

because almost three-quarters of the plantations ready for thinning are inside lynx habitat. Generally, the thinning allowed outside lynx habitat would be in drier places, where western white pine, whitebark pine, and larch do not grow.

Delayed thinning can substantially increase the fuel loading. Fiber-thinning in previously un-thinned 50-year old lodgepole/larch forests on the Bonners Ferry Ranger District have resulted in considerable fuel loading, even when the material removed was used for pulp down to three inches in diameter. Fuel treatments on these thinned areas averaged $50 per acre (Barry Wynsma, pers. com.).

Alternative C

Under Alternative C, Standard VEG S5 allows vegetation management projects in winter snowshoe hare habitat in the stand initiation stage for research, genetic tests sites and within 200 feet of dwellings and associated outbuildings.

While the range of management activities affected has been broadened, the primary activity affected would be precommercial thinning. Alternative C would result in about 184,750 acres thinned in the next decade if fully funded, of which 3,860 acres would be in lynx habitat. Under historic average funding, only 62,470 acres would be accomplished (see Table 3-47).

The effects of Alternative C would be similar to Alternative B. If fully funded, restoration thinning would be forgone on up to 232,620 acres in lynx habitat.

Alternative D

Alternative D modifies Standard VEG S5 to allow a number of vegetation management projects:

- For research and genetic test sites;
- Within 200 feet of dwellings or associated outbuildings;
- To restore western larch, aspen, old growth lodgepole pine, ponderosa pine, western white pine, and whitebark pine forests;
- When a broad-scale assessment has found winter snowshoe hare habitat exceeds the range of historic conditions

Alternative D could result in thinning up to 417,370 acres in the next decade if fully funded; 236,480 acres are in lynx habitat. More acres could be thinned if a broad-scale assessment determines winter snowshoe hare forage conditions exceed the range of historic conditions. Under historic average funding, only 138,420 acres would be thinned (see Table 3-47).

Alternative D would contribute to

Table 3-47. Alternatives C, D, E, & F precommercial thinning next decade

	PCT inside lynx habitat	PCT outside lynx habitat	Total if fully funded	Historic average funding
Alternatives C & E	3,860 acres	180,890 acres	184,750 acres	62,470 acres
Alternative D	236,480 ‡ acres	180,890 acres	417,370 acres	148,420 acres
Alternative F	67,110 acres	180,890 acres	248,000 acres	82,880 acres

‡ For 185,910 acres, only 20 percent of the winter snowshoe hare forage would be removed

restoring whitebark pine, aspen, ponderosa pine, western larch, planted rust-resistant western white pine, and to develop future old growth lodgepole pine. These species and structures require disturbance early in their life cycles to maintain them on the landscape.

Alternative E

Alternative E is similar to Alternative C, except that it allows precommercial thinning for fuel projects. Some thinning may occur to restore fire to the ecosystem; however, the number of acres that may be done as "fuel treatment projects" is not known. It is most likely to take place in aspen, larch, western white pine, and whitebark pine forests.

Alternative F Scenario 1

Alternative F Scenario 1 would apply the management direction to all lynx habitat in LAUs. Alternative F modifies Standard VEG S5 to allow precommercial thinning:

- Within 200 feet of dwellings or associated outbuildings;
- For research and genetic test sites;
- To restore aspen, western white pine and whitebark pine forests; or
- Based on new information that is peer reviewed and accepted by the regional/state levels of the Forest Service and Fish and Wildlife Service, where a written determination states: (1) that a project is not likely to adversely affect lynx; or (2) that a project is likely to have short term adverse effects on lynx or its habitat, but would result in long-term benefits to lynx and its habitat; or
- In the WUI.

Alternative F could result in thinning up to 248,000 acres over the next decade if fully funded; 67,110 acres are in lynx habitat. Under this historic average funding, only 82,880 acres would be thinned (see Table 3-47). More acres could be thinned if new information shows that precommercial thinning would have limited effect or would result in a short term adverse affect, but long-term beneficial effect. Research is being conducted to see if in some situations winter snowshoe hare habitat could be prolonged. Alternative F would contribute to restoring aspen, whitebark pine, and planted rust-resistant white pine.

Alternative F Scenario 2

Under Alternative F, Scenario 2, the management direction would not have to be applied to the Nez Perce, Salmon-Challis, Beaverhead-Deerlodge, Bitterroot, Ashley and Bighorn NFs, and the disjunct mountain ranges on the Custer, Gallatin, Helena and Lewis and Clark NFs until these areas are occupied by lynx.

The effects to those forests currently occupied would be the same as described in Alternative F, Scenario 1. On the currently unoccupied units (100 percent unoccupied), precommercial thinning could occur on an additional 66,870 acres in lynx habitat over the next decade (see Table 3-23 on page 195). This assumes lynx are not considered in project design, which may or may not be the case. Some portion of an additional 38,550 could be thinned on the units with isolated mountain ranges.

Alternative F, Scenario 2, could result in thinning between 315,000 and 353,500 acres over the next decade, if fully funded. About 133,980 acres could be in lynx habitat if fully funded. This includes 67,110 acres as allowed under Alternative F, Scenario 1 and an additional 66,870 acres that could be thinned on the units that are unoccupied. Plus some portion of 38,500 acres of precommercial thinning on the isolated mountain ranges could occur in lynx habitat.

Under the historic average, only 110,000 acres are likely to be thinned (see Table 3-47). Some thinning on the unoccupied units may still not be done if the units consider lynx in the design of their activities. Alternative F, Scenario 2 would contribute to restoring aspen, whitebark pine, and planted rust-resistance white pine. If the areas become occupied at a future time, then the effects on these units would be the same as Alternative F, Scenario 1.

Older multistoried stages

Management actions in older multistoried stages

A multistoried structure generally forms as trees grow old and die and new trees regenerate underneath the canopy of older trees. Two older multistoried stages - the *understory reinitiation* and the *old forest multistoried* - can provide winter snowshoe hare habitat (Ruggiero et. al 2000a; John Squires, pers. com.).

In winter snowshoe hare habitat, an overstory layer of large trees grows above dense undergrowth of trees and shrubs with live crowns within the reach of snowshoe hares during winter when the snow is at its average maximum depth.

Some multistoried forests do not provide winter snowshoe hare habitat because the understory is not dense enough, or the understory live crowns are too far above the snow for the hares to reach.

Forest Inventory and Assessment (FIA) data for Montana was used to gauge how much lynx habitat exists in multistoried stages - for more discussion, see the *Lynx* section. About 1.5 million acres or 16 percent of lynx habitat is multistoried and provides some level of winter snowshoe hare habitat - see Table 3-48 here and Table 3-2 earlier in the *Lynx* section.

About 75 percent of the multistoried forests are outside wilderness. It is likely that a similar percentage occurs in the rest of the planning area, since western Montana is similar to northern Idaho and eastern Montana is similar to Wyoming, Utah, and southern Idaho.

Vegetation management projects that may take place in multistoried forests outside of wilderness include:

Precommercial thinning
Precommercial thinning removes some small trees to improve the growing conditions for the remaining trees. Precommercial thinning takes place mostly in the young forests created by regeneration harvest or fires. Little precommercial thinning takes place in multistoried forests. Precommercial thinning can negatively affect snowshoe hare populations (LCAS).

Understory thinning
Understory thinning, or thinning from below, removes smaller trees growing under taller ones, to remove ladder fuels or to improve the health and vigor of the overstory. Understory thinning may or may not provide commercial products.

Winter snowshoe hare habitat may or may not be directly affected depending on the

Table 3-48. Multistoried lynx habitat on NFS lands in Region I Montana

	Inside wilderness	Outside wilderness	Total
High density forests	355,000 acres	1,120,000 acres	1,475,000 acres
Low density forests	198,000 acres	812,000 acres	1,010,000 acres
Total	553,000 acres	1,932,000 acres	2,485,000 acres

size of trees removed. Winter snowshoe hare habitat would be affected if the entire understory were removed, including the trees within reach of hares. If mid-story trees are removed, some of the winter snowshoe hare habitat may be affected.

Commercial thinning

Commercial thinning generally removes mid-story trees to reduce competition with other trees. Some commercial thinning may take place in multistoried forests. Winter snowshoe hare habitat would not be substantially affected because small trees are not removed, except in skid trails, unless it is combined with understory thinning.

Even-age harvests

Even-age harvests include clearcuts, seed tree cuts, and shelterwood harvests. These harvest methods remove mid- and overstory trees with commercial value, to regenerate even-age forests. Clearcutting removes all the trees. Seed tree cuts retain some large trees and shelterwood cuts retain more overstory trees, until seedlings become established.

Typically, all the understory trees are removed; even-aged harvests remove winter snowshoe hare habitat.

Two-age harvests

Two-age harvests are clearcuts, seed tree cuts, and shelterwood cuts that retain some overstory trees. They retain structural diversity and result in a two-age stand as an understory of younger trees regenerate. Typically, all the understory trees are typically removed in two-aged treatments; two-age harvests remove winter snowshoe hare habitat.

Uneven-age harvests

Uneven-age harvests remove trees with commercial value either individually or in groups. They maintain a multi-age structure by removing some trees of all sizes and by regenerating the openings.

Uneven-age harvests can either create or remove winter snowshoe hare habitat.

- If understory trees are removed during logging, forage could be lost.
- If openings are created providing space where young trees can grow, forage could be created.

Salvage logging

Salvage logging removes trees that are dead, damaged, or dying in order to recover economic value. Salvage harvest typically results in removing the dead or dying, large overstory trees, but not the small understory trees or live large overstory trees whose branches come down to the snowline, that make up winter snowshoe hare habitat. Some small trees may be incidentally removed in skid trails or skyline corridors.

Prescribed fire

Prescribed fire removes the understory trees, and sometimes overstory trees as well, depending on the management objective. Prescribed fire may or may not include mechanical treatment such as slashing or understory thinning before burning. Prescribed fires remove understory trees and winter snowshoe hare habitat.

Table 3-49. Projects allowed in multistoried winter snowshoe hare habitat under Standard VEG S6

Kind of project	Alt A	Alt B	Alt C	Alt D	Alt E	‡‡Alt F
Precommercial thinning	Yes, where allowed in plans	No, except near structures	No, except near structures or for research	No, except near structures, for research, for restoring whitebark pine, western white pine, larch, ponderosa pine & old growth lodgepole, or when there's an abundance of multistoried winter snowshoe hare forage	Possible to deviate from Guideline VEG G8 with rationale	No, except in WUI, near structures, research, or incidental removal during salvage
Understory thinning	Yes	Yes, if commercial; No, if non-commercial	Same as above	Same as above	Same as above	Same as above
Commercial thinning ‡	Yes	Yes	Same as above	Same as above	Same as above	Same as above
Even-age harvest	Yes	Yes	Same as above	Near structures, to recruit forage in openings, or when there's an abundance of multistoried winter snowshoe hare forage	Same as above	Same as above
Two-age harvest	Yes	Yes	Same as above	Same as above	Same as above	Same as above
Uneven-age harvest ‡	Yes	Yes	Same as above	To recruit forage in openings	To recruit forage in openings	To recruit forage in openings
Salvage ‡	Yes	Yes	Same as above	Near structures, to create openings or to improve or maintain forage	Yes, incidental removal of forage allowed	Yes, incidental removal of forage allowed
Prescribed fire ‡	Yes	Yes	Same as above	Near structures, to create openings, to improve or maintain forage, or for whitebark pine	Possible to deviate from guideline VEG G8 with rationale	No, except in WUI

† Under Alternative E, Standard VEG S6 is dropped and replaced by Guideline VEG G8
‡ Vegetation management projects can take place without reducing winter snowshoe hare forage, depending on where the forage is and where the target trees are. It's likely that under Alternatives C, D, E and F, some foraging habitat would be removed – these projects would be deferred.
‡‡ Alternative F Scenario 1 would apply the management direction to all lynx habitat in LAUs. Alternative F Scenario 2 would apply the management direction to occupied lynx habitat in LAUs.

Effects in older multistoried stages

This analysis evaluates the effects of the alternatives on a variety of vegetation management projects that could take place in the multistoried forests. However, the analysis is qualitative because there is little information on how many of the 1.9 million acres of multistoried lynx habitat outside wilderness are likely to need treatment. Effects on fuel treatments are discussed in the *Fire* section.

Standard VEG S6 applies to multistoried forests and would limit certain activities depending on the alternative.

Alternative A, the no action alternative

Under the no-action alternative, no changes would be made to existing plans. Vegetative management projects would not be precluded in multistoried forests except as already precluded in existing plans.

Alternative B

Standard VEG S6

Under Alternative B, Standard VEG S6 would not allow precommercial thinning that reduces winter snowshoe hare habitat in multistoried forests. It allows thinning within 200 feet of administrative sites, dwellings, and outbuildings to create a space defensible from fire.

Under Alternative B, Standard VEG S6 defers only precommercial thinning or understory treatments. It does not defer prescribed burning, even-age, two-age, uneven-age, or salvage harvests.

Table 3-49 (previous page) shows which vegetation management projects that reduce winter snowshoe hare habitat in multistoried forests would be limited by Standard VEG S6 under the different alternatives.

Alternative C

Under Alternative C, Standard VEG S6 would not allow any vegetation management projects that reduce winter snowshoe hare habitat in multistoried forests except for those:

- Within 200 feet of administrative sites, dwellings or outbuildings
- For research studies

Understory trees are not distributed uniformly, so it may be possible to remove trees without affecting foraging habitat.

Standard VEG S6 also would defer prescribed fire and precommercial thinning to restore whitebark pine in some places. Whitebark pine treatments are planned on about 60,000 acres during the next decade.

It is not known how many of those areas provide winter snowshoe hare habitat. It is likely some areas would not be treated due to this standard, further contributing to the decline of whitebark pine.

It is difficult to determine what effect this standard would have on timber sales. It is likely some activities would not occur in some places or would be deferred because of this standard.

Most timber harvest takes place on the suitable timber base, where timber harvest is allowed under existing plans. About half of the multistoried habitat that could provide winter snowshoe hare habitat is in the suitable timber base.

Alternative D

Under Alternative D, Standard VEG S6 would allow vegetation management projects that reduce winter snowshoe hare habitat in multistoried forests:

- Within 200 feet of administrative sites, dwellings or outbuildings
- For research studies
- To restore whitebark pine
- To restore or maintain western white pine, western larch, ponderosa pine so long as 80 percent of the winter snowshoe hare habitat is retained
- To develop future old growth characteristics in lodgepole pine
- To improve or maintain winter snowshoe hare habitat in the long term
- When a broad scale assessment determines that the amount of multistoried winter snowshoe hare habitat exceeds what is expected in the normal range of historic conditions.

Other projects would be deferred until forests no longer provide foraging habitat. Some projects would be allowed if they improve or maintain forage habitat in the long term.

Multistoried forests include a variety of conditions. Some forage habitat is likely to be growing out of reach of snowshoe hares – removing these trees under these conditions and initiating a new crop of trees could prolong forage.

Under Alternative D, it is difficult to determine the effect Standard VEG S6 would have on timber programs. Alternative D allows vegetation management projects under a variety of circumstances. One condition allows projects that improve forage over the long term – timber harvest could be used to create openings for new forage to develop. Still, it is likely some vegetation management projects would not take place because of this standard.

Alternative D would not interfere with efforts to restore whitebark pine. It would allow projects that restore and maintain this species.

Alternative E

Under Alternative E, Standard VEG S6 is dropped and the management direction added in Guideline VEG G8. The guideline recommends retaining winter snowshoe hare habitat in multistoried forests but allows timber harvest where understory forage is lacking.

Winter snowshoe hare habitat would have to be considered when designing timber projects, but it could be removed if reasons can be documented.

Alternative F Scenario 1

Alternative F Scenario 1 would apply the management direction to all lynx habitat in LAUs.

Under Alternative F, Standard VEG S6 would not limit vegetation management activities in multistoried forests adjacent to dwellings, for research studies, for incidental removal during salvage harvests, or for fuel treatment projects in

the WUI. The standard allows harvest, such as group selection, in areas that have potential to improve winter snowshoe hare habitat but presently have poorly developed understories. Essentially removing groups of trees in these areas may provide improved conditions for developing a young understory component.

Under Alternative F, it is difficult to determine the effect Standard VEG S6 would have on timber programs. Alternative F allows vegetation management projects under a few circumstances. However, it is likely some activities would not occur in some places or would be deferred because of this standard.

Alternative F Scenario 2

Under Alternative F, Scenario 2, the management direction would not have to be applied to the Nez Perce, Salmon-Challis, Beaverhead-Deerlodge, Bitterroot, Ashley and Bighorn NFs, and the disjunct mountain ranges on the Custer, Gallatin, Helena and Lewis and Clark NFs until these areas are occupied by lynx. Under Alternative F Scenario 2, activities in multistoried winter snowshoe hare habitat could occur, unless the areas become occupied. Management direction can still be considered; therefore it is likely some projects would be designed to meet lynx needs and some would not.

Other vegetation standards and guidelines that could affect timber harvest

Several other standards and guidelines may affect the ability to harvest timber in lynx habitat. They vary by alternative, and include:

- *Standard VEG S1:* Vegetation management projects would be restricted in LAUs with 30 percent or more in a stand initiation structural stage that does not yet provide for winter snowshoe hare habitat. These areas include forests that are regenerating following timber harvest or fire and the trees or shrubs are too short to provide forage and cover for snowshoe hares during winter. Generally, this stage exists for ten to 30 years after disturbance.
- *Standard VEG S2:* Regeneration timber harvest would be restricted in LAUs if it leads to 15 percent or more in a stand initiation structural stage that does not yet provide for winter snowshoe hare habitat created during the past decade.
- *Standard VEG S3:* Vegetation management projects would be restricted when there is less than ten percent denning habitat in an LAU.
- *Standard VEG S4:* Generally, salvage logging would not be allowed in disturbed areas five acres or smaller. However, when field validation and mapping finds an LAU contains ten percent denning habitat well distributed, small patches may be salvage logged.

- *Guideline VEG G1:* Create winter snowshoe hare habitat where it is scarce or absent.

Alternative A, no action

Under the no-action alternative, no changes would be made to existing plans. Vegetative management projects would not be precluded in multistoried forests except as already precluded in existing plans.

Timber harvest and salvage logging could take place where currently allowed.

Alternative B

Standard VEG S1

Under Alternative B, Standard VEG S1 would limit vegetation management projects when there is more than 30 percent in very young regenerating forests in an LAU unless a broad scale assessment substantiates different historic levels.

Only a few LAUs (less than 13 percent in FS Region 1) exceed 30 percent, resulting from wildfires that burned large areas (Hillis et al. 2003).

Salvage harvest generally would not be constrained by this standard because removing dead trees does not create the stand initiation structural stage. The original disturbance created this condition.

Standard VEG S2

Under Alternative B, Standard VEG S2 would limit timber harvests if they produced more than 15 percent in a stand initiation structural stage that does not yet provide for winter snowshoe hare habitat in a 10-year period. About 13 percent of the LAUs in Montana have more than 15 percent in a young stand initiation structural stage, mostly resulting from wildfires.

Salvage harvest would not be constrained by this standard.

Standard VEG S3

Under Alternative B, Standard VEG S3 restricts projects in LAUs with less than ten percent denning if they remove vegetation from areas with the highest potential to develop denning habitat.

Generally, denning habitat is not likely a limiting factor in the planning area (Hickenbottom et al. 1999). Where there is not enough, projects would be precluded, which would primarily affect salvage logging.

Standard VEG S4

Under Alternative B, Standard VEG S4 generally restricts salvage logging where trees have been killed in pockets smaller than five acres. However, it does not apply when an LAU has been mapped and field-verified to contain ten percent denning habitat.

It is likely many LAUs provide enough denning habitat, but some salvage may be precluded.

Guideline VEG G1

Under Alternative B, Guideline VEG G1 says projects should be planned to develop winter snowshoe hare habitat where it is lacking. A variety of projects could be done where there is less than 30 percent in a stand initiation structural stage, or less than 15 percent created by timber harvest.

Summary for Alternative B
Alternative B may defer timber projects in some areas because of Standards VEG S1, VEG S2, and VEG S3. Guideline VEG G1 encourages vegetation management, including timber harvest to create winter snowshoe hare habitat.

It is likely there would be no change in overall timber harvest outputs, but there may be changes in what material is harvested and where. The effect of Alternative B on salvage projects is likely to be limited because it is likely many – if not all - LAUs provide ten percent denning.

Alternative C

Standard VEG S1
Under Alternative C, Standard VEG S1 applies to multiple LAUs. Some projects that create more than 30 percent in a stand initiation structural stage that is too short to provide winter snowshoe hare habitat may be deferred, but only where large fires burned, such as the 1988 Yellowstone and Canyon Creek fires (Hillis 2003).

Standard VEG S2 dropped, Guideline VEG G6 added
Under Alternative C, Standard VEG S2 is dropped and the management direction added in Guideline VEG G6. Guideline VEG G6 would have limited effect on timber projects both because it is a guideline and because few LAUs exceed 15 percent in a stand initiation structural stage caused by timber harvest. It would not affect salvage logging.

Standards VEG S3 & VEG S4
Alternative C includes the same version of Standard VEG S3 as Alternative B. It also includes Standard VEG S4, which would allow salvage logging on patches smaller than five acres next to homes.

Generally, these standards would not limit timber or salvage projects because it is likely many – if not all - LAUs provide enough denning habitat, but some projects could be deferred or dropped.

Guideline VEG G1
Under Alternative C, Guideline VEG G1 has been changed to encourage projects in the stem exclusion stage.

Summary for Alternative C
Alternative C may defer timber projects in some areas because of Standards VEG S1 and VEG S6 and Guideline VEG G6. Guideline VEG G1 encourages projects that create winter snowshoe hare habitat.

It is likely there would be no change in overall timber harvest outputs, but there may be changes in what material is harvested and where. The effect of Alternative C on salvage projects is likely to be limited because it is likely most LAUs provide ten percent denning.

Overall, fewer timber projects are likely to be deferred under Alternative C because Standard VEG S1 is less constraining than Alternative B.

Alternative D

Standard VEG S1
Under Alternative D, Standard VEG S1 applies to a sub-basin or isolated mountain range. The standard is likely to constrain vegetative management projects that create a stand initiation structural stage only in areas that had very large

fires such as the 1988 Canyon Creek and Yellowstone fires (Hillis 2002).

Standard VEG S2 & Guideline VEG G6 both dropped
Alternative D drops Standard VEG S2 and Guideline VEG G6 as well, so they have no effect to timber management.

Standard VEG S3
Alternative D modifies Standard VEG S3 to let project design mitigate effects in denning habitat. Projects would still need to leave some overstory and enough coarse woody debris to provide den sites. Generally, salvage projects could be designed to meet these objectives.

Standard VEG S4 dropped, Guideline VEG G7 added
Under Alternative D, Standard VEG S4 is dropped and the management direction added in Guideline VEG G7. Retaining the small patches of dead trees would be considered, but salvage harvest could take place if there is reason to do so.

Summary for Alternative D
Alternative D may defer timber projects in some places because of Standards VEG S1 and VEG S6. Alternative D is not likely to affect timber projects, except even-age or two-age harvests where large fires have occurred.

It is likely there would be no change in overall timber outputs, but there may be changes in what material is harvested and where. Alternative D would have limited effects on salvage harvest.

Overall, fewer timber projects are likely to be deferred under Alternative D because Standards VEG S1 and VEG S6 are less constraining than Alternatives B or C.

Alternative E

Standard VEG S1
Under Alternative E, Standard VEG S1 applies to multiple LAUs. Some projects that create more than 30 percent in a stand initiation structural stage may be deferred, but only where large fires had burned. The standard would not apply to timber harvest used to meet fuel treatment objectives.

Standard VEG S2 & Guideline VEG G6 both dropped
Alternative E drops Standard VEG S2 and Guideline VEG G6, the same as under Alternative D, so they have no effect to timber management.

Standard VEG S3
Under Alternative E, Standard VEG S3 would require leaving some overstory and enough coarse woody debris to provide den sites if denning habitat was lacking. It would not apply to salvage logging done for fuel treatment.

Standard VEG S4 dropped, Guideline VEG G7 added
Under Alternative E, Guideline VEG G7 would encourage retaining small patches of dead trees, but salvage harvest could take place with adequate rationale.

Summary for Alternative E
Alternative E has similar effects on timber harvest as Alternative C. Standard VEG S1 and Guidelines VEG G6 and VEG G8 may defer harvest in some areas, but Guidelines VEG G6 and VEG G8 also encourage projects creating winter snowshoe hare habitat where it is lacking. Timber harvest would not be precluded if done to meet fuel treatment objectives

developed through a collaborative process.

It is likely there would be no change in overall timber harvest outputs, but there may be changes in what material is harvested and where. Alternative E also would not constrain fuel treatment, so it would have less effect on timber outputs than Alternative C.

The effects of Alternative E on salvage projects are similar to Alternative D.

Alternative F Scenario 1

Alternative F Scenario 1 would apply the management direction to all lynx habitat in LAUs. Under Alternative F, Standard VEG S1 applies to a single LAU. Some projects that create more than 30 percent in a stand initiation structural stage may be deferred, but only where large fires had burned. The standard would not apply to regeneration harvest used to meet fuel treatment objectives in the WUI.

Standard VEG S2
Under Alternative F, Standard VEG S2 would limit regeneration harvests if they result in more than 15 percent in a stand initiation structural stage in a 10-year period. About 13 percent of the LAUs in Montana have more than 15 percent in a young stand initiation structural stage, mostly resulting from wildfires.

Salvage harvest would not be constrained by this standard.

Standard VEG S3, Standard VEG S4 dropped, Guideline VEG G11 added
Under Alternative F, Standards VEG S3 and S4 are dropped and are replaced by Guideline VEG G11. This guideline says denning habitat should be distributed in an LAU and if not, projects should be designed to retain some coarse woody debris or residual trees. Very few, if any timber harvest projects would be constrained due to this guideline.

Summary for Alternative F Scenario 1
Standards VEG S1 and S2 may defer regeneration harvest in some areas, but Guideline VEG G1 encourages projects creating winter snowshoe hare habitat where it is lacking. Some timber harvest may be redesigned or dropped in to meet lynx needs.

It is likely there would be no change in overall timber harvest outputs, but there may be changes in what material is harvested and where. Alternative F also would not constrain fuel treatment in the WUI, so it would have less effect on timber outputs than Alternatives B, C or D, but more than E.

Alternative F, Scenario 2

Under Alternative F, Scenario 2, the management direction would not have to be applied to the Nez Perce, Salmon-Challis, Beaverhead-Deerlodge, Bitterroot, Ashley and Bighorn NFs, and the disjunct mountain ranges on the Custer, Gallatin, Helena and Lewis and Clark NFs until these areas are occupied by lynx.

Under Alternative F, Scenario 2, Standards VEG S1 and S2 would not have to constrain projects on unoccupied forests. Generally, these standards are not exceeded anyway, so there would be likely little change (Hillis et al. 2003). Management direction can still be considered; therefore it is likely some

projects would be designed to meet lynx needs and some would not. In the cases lynx are considered then some timber harvest may be redesigned or dropped. In other cases there would be no change in design.

On the unoccupied units it is likely there would be no change to overall timber harvest outputs, but there still could be changes in what material is harvested and where.

Effects to ASQ and LTSY

Several people felt the management direction may affect the Allowable Sale Quantity (ASQ) and Long Term Sustained Yield (LTSY). Therefore this section has been included in the FEIS to fully disclose the effects on these components.

ASQ

ASQ is the quantity of timber that may be sold from the area of suitable land covered by the forest plan for a time period specified by the plan. This quantity is usually expressed on an annual basis as the "average annual allowable sale quantity" (36 CFR 219.3 (1982 regulations)).

Under any alternative standards VEG S1 and VEG S2 may defer regeneration harvest in some areas, but commercial thinning, or other "intermediate" treatments could occur in lieu of regeneration harvest. In addition, Guideline VEG G1 encourages projects creating winter snowshoe hare habitat (regeneration harvest) where winter habitat is lacking. Based on this, the management direction would likely have no change in overall timber harvest outputs, but the direction may change what material is harvested and where. The management direction would not modify the quantity of timber that may be sold from the area of suitable land covered by the forest plan; therefore there would be no change to the ASQ on any unit.

LTSY

LTSY is the highest uniform wood yield that may be sustained under specified management intensities consistent with multiple-use objectives after stands have reached desired conditions (36 CFR 219.3 (1982 regulations) and FSH 1909.12 60.5).

All alternatives limit precommercial thinning to some degree. Limiting precommercial thinning in lodgepole pine forests could affect LTSY because it reduces the ability for these forests to grow and become merchantable. As noted in the section on lodgepole pine, if these forests are not thinned they become suppressed and would not release without some type of disturbance and generally no other tree species would replace them.

Limiting thinning in other forest types, such as in mixed conifer and spruce fir types does not have the same effect. Trees that require full sun, such as white pine or larch would just be replaced by other tree species that do not require sun; so there would be no difference in the amount of wood yield from the site, but there would be a difference in the species.

The Beaverhead-Deerlodge and Bridger-Teton National Forests are the only units that have a majority of their precommercial thinning scheduled over

the next ten years in lynx habitat and in lodgepole pine (Appendix K, Table K-5). However, under current programs, the units only have funding for about 34 percent of their thinning program, so it is difficult to distinguish the effects from the management direction in this proposal from the effects of budgets. Only under substantial increased budgets would there be an identifiable effect, and such budgets are unlikely.

Alternative D would allow precommercial thinning in lodgepole pine forests; therefore this alternative would not affect LTSY.

Alternatives B, C, and E would limit precommercial thinning and lodgepole pine forests; therefore they could have an effect on LTSY.

Alternative F Scenario 1 limits precommercial thinning in lodgepole pine forests in lynx habitat, but allows for consideration of new information. It is possible new information would become available that would indicate some thinning in these forests may be beneficial to winter snowshoe hare habitat by increasing the length of time forage is available. (See the project record, DEIS comment # 505. This comment contains a summary of a thesis paper and discusses this possibility and reference Shaw 2002.) Therefore, for Alternative F it is uncertain whether or not LTSY would be affected.

Under Alternative F Scenario 2 the management direction only applies to occupied lynx habitat. At this time the Beaverhead-Deerlodge National Forest is considered unoccupied; therefore the management direction would not apply.

The Forest Plans for both the Beaverhead-Deerlodge and Bridger-Teton National Forests are being revised. The Beaverhead-Deerlodge should complete their revision process in 2007. Their draft EIS for the Forest Plan recognizes the potential cumulative contribution the management direction may have on reducing growth and yield (DEIS, page 326); therefore their plan is accounting for this change. The Bridger-Teton should complete its revision in 2008.

Cumulative effects

Alternative A

On species of decline

Disturbance processes such as fire would continue to shape the landscapes of the northern Rockies. Fire suppression would also continue, resulting in forests with too many trees and continuing the change in species composition from those that depend on fire to those that do not. Efforts to restore species of decline would continue through reforestation, thinning, and prescribed fire, cumulatively improving conditions over time.

On timber program

Past, present, and reasonably foreseeable actions listed in Appendix L have reduced the area available for timber harvest. Other tools, such as prescribed fire would be used to meet resource objectives in these areas.

Alternatives B, C, D, E, and F

On species of decline

Like Alternative A, the natural disturbance processes and fire suppression would continue. Using fire would be encouraged to restore ecosystems. The tools used to restore tree species in decline would be more limited; it is likely that some would experience further decline. However, restoration could take place outside lynx habitat or in areas that do not provide winter snowshoe hare habitat. More tools would be available under Alternatives D and F, so the extent of effect would not be as great.

On timber program

Past, present, and reasonably foreseeable actions listed in Appendix L have reduced the area available for timber harvest. Other tools, such as prescribed fire would be used to meet resource objectives in these areas. The proposal would have a limited cumulative effect on the timber program. There could be a change in the type of material harvested and where.

Plants

Affected environment

The planning area contains populations of 283 rare plant species (see Appendix J). They include eleven federally listed species, four federal candidate species, and 268 Regional Foresters' Sensitive Species (USDA FS 2004c, 2004d, 2005a, and 2007).

These plants occur infrequently and are generally found in specific habitats. Many are found in wetter areas because they need more moisture to survive. Some are found in older stands of lodgepole pine, grand fir, or subalpine fir. A few are associated with young regenerating stands, and some require periodic disturbance to maintain their populations.

Of the federally listed plant species, only two have known occurrences or suitable habitat in lynx habitat or lynx linkage habitat. These two species are water howellia (*Howellia aquatilis*) and Ute ladies' tresses (*Spiranthes diluvialis*). In addition, one candidate for listing, slender moonwort *(Botrychium lineare)* has known occurrences and suitable habitat in lynx habitat and lynx linkage habitat.

The Biological Assessment for threatened and endangered plant species (in project file) contains the detailed descriptions and analysis of the threatened and endangered plant species in the lynx planning area. The following is a brief description of their occurrences and habitat needs:

Water howellia (*Howellia aquatilis*) is a federally listed threatened species. It grows in wetland fens, pothole ponds, and old oxbows along river drainages (Shelly 1988, USDA Forest Service 1997c). In the lynx planning area it is known primarily from the Swan River Valley in Montana, although it is also known from one location in Idaho (Montana Natural Heritage Program 2007).

Ute ladies'-tresses *(Spiranthes diluvialis)* is a federally listed threatened species. It grows in some of the shallow, braided wetlands and seep areas in Montana and Idaho (Heidel 1997). It also occurs in Utah (Utah Division of Wildlife Resources 1998).

Slender moonwort *(Botrychium lineare)*, a candidate for federal listing (USDI FWS 2001), has known populations in Montana and Idaho in open areas such as roadsides and other areas dominated by low-growing plants.

Although **whitebark pine** is not a threatened, endangered, or sensitive (TES) plant, whitebark pine is in steep ecological decline due to a number of threats to the species; the threats are fire suppression, white pine blister rust, and mountain pine beetle. Thinning can imitate some of the effects of the fires that historically favored whitebark pine over its competitors in mid- and high-subalpine zones after stand-replacing wildfire.

Effects

The proposal would add restrictions and encourage such activities as wildland fire use at the programmatic level. It would have no direct effects.

It is difficult to determine indirect effects of programmatic direction to individual populations or habitat niches except on a very broad scale. Therefore, this analysis evaluates potential effects at the broad scale from the restrictions imposed and activities encouraged, focusing primarily on the objectives, standards and guidelines for vegetation management.

Alternative A, the No Action Alternative

Under the no-action alternative, the existing management direction in the existing plans for threatened, endangered, and sensitive species plants would remain in place. Alternative A would have no direct, indirect, or cumulative effects on threatened, endangered, and sensitive species plants beyond those of the current plans. Current plans require site-specific analysis before projects can be implemented, so any effects on TES plants would be subject to future site-specific analysis at the time a project is analyzed.

Alternatives B, C, D, E, and F

Vegetation objectives

In all the action alternatives, Objectives VEG O1 through VEG O4 describe managing vegetation based on historical succession and disturbance processes, and encourage the development of snowshoe hare habitat, as the desired future condition.

Using historic succession and disturbance regimes, including fire, to restore ecological processes should help create a dynamic array of habitat types distributed across the landscape for TES plants.

Vegetation standards

In all action alternatives Standards VEG S1 through VEG S6 limit the location or extent of vegetation management projects more than the existing plans.

The impact of Standard VEG S1 is virtually the same among the action alternatives; the difference in the standard among the alternatives is at what scale the standard is applied. VEG S1 basically says that if more than 30 percent of lynx habitat currently does not yet provide winter snowshoe hare habitat no additional habitat may be harvested at that time (see Table 2-1 for the specific wording for each alternative). Generally, these limitations would not adversely affect TES plants because they constrain projects more than do the existing plans.

Alternative B, the Proposed Action

Vegetation standards and guidelines

Under Alternative B, Standards VEG S1 through VEG S6 and Guidelines VEG G1 through VEG G5 limit the location or extent of vegetation management projects. Generally, these limitations would not adversely affect TES plants because they constrain projects more than do the existing plans.

Standard VEG S2

Timber management projects shall not change more that 15 percent of the lynx habitat in an LAU in any ten-year period. Generally, this limitation would not

adversely affect TES plants because it constrains projects more than do the existing plans.

Standards VEG S3 & S4
These standards concern maintaining adequate amounts of lynx denning habitat on the landscape. Generally, these limitations would not adversely affect TES plants because they constrain projects more than do the existing plans.

Standards VEG S5 & VEG S6
Under Alternative B, Standards VEG S5 and VEG S6 would prohibit precommercial thinning in lynx habitat, but would allow thinning to treat fuels within 200 feet of dwellings.

Prohibiting precommercial thinning would not have detrimental effects on the habitat types or ecological communities upon which any TES plants depend, and may prove beneficial to some in the long run. Allowing precommercial thinning with 200 feet of dwellings would not substantially affect any TES plants or habitat.

Young regenerating forests
In young regenerating forests, limiting thinning could help diversify habitats. Adverse effects on plants are the greatest when the thinning is heavy. Generally, light thinning has no effect, and sometimes if an underburn follows light thinning, the effect is beneficial.

Older multistory forests
In older multistory forests, plants often become established in the gaps created when overstory trees die or otherwise no longer fully occupy their growing space. Such plants can be characterized by their ability to establish and grow in reduced sunlight.

Restoring whitebark pine
Returning historic fire regimes would be the most successful way to restore whitebark pine, but would be difficult to implement. Current restoration efforts rely on thinning and precommercial thinning in subalpine fir forests to mimic the effects of fire. Precommercial thinning could not be used under Alternative B, but prescribed burning could.

Therefore, Alternative B may result in a reduced ability to plan and implement whitebark pine restoration projects. Losing precommercial thinning as a tool would affect the ability to manage for the species across its range.

Grazing
Under Alternative B, Objective GRAZ O1 and Standards GRAZ S1 through S4 provide direction for the management of livestock grazing to assure the regeneration and sustainability of trees and shrubs. Standard LINK S2 requires the management of livestock grazing in linkage areas to contribute to maintaining or moving the shrub-steppe habitat to mid or late serial stage. There are no grazing guidelines under Alternative B.

Many of the TES plants in the planning area depend on riparian areas, so the management of livestock grazing may prove beneficial to them in the long term. Applying Standard GRAZ S4 in *shrub-steppe* (dry places where grasslands are mixed with shrubs often including sagebrush) and Standard GRAZ S3 in wet areas would help recreate historic conditions.

Human uses
Under Alternative B, Objectives HU O1 through HU O6, Standards HU S1 through HU S3, and Guidelines HU G1 through HU G9 would limit the amount of disturbance allowed from special uses, mineral exploration, and development.

Any ground-disturbing activity that removes vegetation or soil, or fragments habitat, can affect TES plants. Alternative B should reduce these impacts.

Water howellia
Beneficial effects to water howellia may result in the long term if historic succession and disturbance regimes are restored. Although no vegetation activities would occur in water howellia habitat, the species would benefit indirectly through the maintenance of the historic hydrologic regime resulting from permitted vegetation treatments.

Ute ladies'-tresses
Beneficial effects to Ute ladies'-tresses may result in the long term if historic succession and disturbance regimes are restored. The grazing direction would benefit this riparian-dependent species.

Slender moonwort
There may be beneficial effects to slender moonwort from the management direction in Standard GRAZ S1 concerning young regenerating forests.

Alternative C

The effects of Alternative C are likely to be mostly beneficial to most TES plants and similar to Alternative B, particularly for grazing and human uses.

Vegetation standards and guidelines
Under Alternative C, Standards VEG S1, VEG S3 through VEG S6, and Guidelines VEG G1 through VEG G6 limit the location or extent of vegetation management projects. Generally, these limitations would not adversely affect TES plants because they constrain projects more than do the existing plans.

Standard VEG S2
This standard is changed to Guideline VEG G6 in Alternative C. It says that timber management project should not change more that 15 percent of the lynx habitat in an LAU in any ten-year period. Generally, this limitation would not adversely affect TES plants because it still constrains projects more than do the existing plans.

Standards VEG S3 & S4
Standard VEG S3 is slightly reworded in Alternative C, and Standard VEG S4 is changed to Guideline VEG G7 in Alternative C. Both the standard and guideline concern maintaining adequate amounts of lynx denning habitat on the landscape. Generally, these limitations would not adversely affect TES plants because they still constrain projects more than do the existing plans.

Standards VEG S5 & VEG S6
Under Alternative C, Standards VEG S5 and VEG S6 restrict all vegetation management projects, not just precommercial thinning. Research studies and treating fuels within 200 feet of administrative sites, dwellings, and outbuildings would, however, be allowed.

Effects on TES plants would be minimal because of the minimal extent of the

projects. Such projects already take place under existing plans; few TES plants are associated with the young regenerating forests where such projects would likely take place.

Alternative C would not allow vegetation management, including prescribed burning, to help restore whitebark pine, and so would result in a reduced ability to do whitebark pine restoration projects.

Grazing
Under Alternative C the grazing objective and standards, and the linkage standard are identical to those in Alternative B, therefore the effects would be the same. Objective GRAZ O1 and Standards GRAZ S1 through S4 provide direction for the management of livestock grazing to assure the regeneration and sustainability of trees and shrubs. Standard LINK S2 requires the management of livestock grazing in linkage areas to contribute to maintaining or moving the shrub-steppe habitat to mid or late serial stage. There are no grazing guidelines under Alternative C.

Many of the TES plants in the planning area depend on riparian areas, so the management of livestock grazing may prove beneficial to them in the long term. Applying Standard GRAZ S4 in *shrub-steppe* (dry places where grasslands are mixed with shrubs often including sagebrush) and Standard GRAZ S3 in wet areas would help recreate historic conditions.

Human uses
Under Alternative C, Objectives HU O1 through HU O6 are identical to those in Alternative B. Standards HU S1 has been reworded to allow no increase in designated over the snow routes outside of areas of consistent snow compaction. Standard HU S2 has been changed to Guideline HU G10, and Guideline HU G6 has been slightly reworded. Standard HU S3 and the rest of the guidelines have remained the same as in Alternative B. As in Alternative B, the direction would limit the amount of disturbance allowed from special uses, mineral exploration, and development.

Any ground-disturbing activity that removes vegetation or soil, or fragments habitat, can affect TES plants. Alternative C should reduce these impacts.

Water howellia
Beneficial effects to water howellia may result in the long term if historic succession and disturbance regimes are restored. Although no vegetation activities would occur in water howellia habitat, the species would benefit indirectly through the maintenance of the historic hydrologic regime resulting from permitted vegetation treatments.

Ute ladies'-tresses
Beneficial effects to Ute ladies'-tresses may result in the long term if historic succession and disturbance regimes are restored. The grazing direction would benefit this riparian-dependent species.

Slender moonwort
There may be beneficial effects to slender moonwort from the management direction in Standard GRAZ S1 concerning young regenerating forests.

Alternative D

The effects of Alternative D are likely to be mostly beneficial to most TES plants and

similar to Alternatives B and C, particularly for grazing and human uses.

Vegetation standards and guidelines
The VEG standards and guidelines limit the location or extent of vegetation management projects. Generally, these limitations would not adversely affect TES plants because they constrain projects more than do the existing plans.

Standards VEG S1 through VEG S4
Under Alternative D, Standard VEG S1 is applied at the sub-basin or isolated mountain range scale rather than at the LAU scale. There is no Standard VEG S2. Standard VEG S3 allows management that moves the LAU towards the 10 percent denning habitat. Standard VEG S4 is included as part of Guideline VEG G7. Generally, these limitations would not adversely affect TES plants because they constrain projects more than do the existing plans.

Standards VEG S5 & VEG S6
Under Alternative D, Standards VEG S5 and VEG S6 would restrict all vegetation management projects, not just precommercial thinning. However, more types of projects would be allowed.

Projects would be allowed that restore whitebark pine; that remove conifers in aspen stands; and that release larch, ponderosa pine, and white pine by daylight thinning, removing no more than 20 percent of the forest cover. Research studies and treating fuels within 200 feet of administrative sites, dwellings, and out buildings also would be allowed.

Management would also be allowed to help develop future old growth characteristics in lodgepole stands. Management would be allowed when a broad scale assessment determines the amount of winter snowshoe hare habitat in the stand initiation stage exceeds what would be expected under the normal range of historic conditions.

Any of these types of projects would be conducted in young, regenerating forests, and so would not substantially affect TES plants since few TES plants occur where most of these types of projects would take place.

Under Alternative D, Standard VEG S6 would also allow projects in multistoried stands that maintain or improve winter snowshoe hare habitat in the long term.

Generally, the limitations under Standards VEG S5 and S6 would not adversely affect TES plants because they still constrain projects more than do the existing plans. Projects could include uneven aged management, salvage, or prescribed fire that could impact TES plants. As in the other alternatives, site-specific analysis for TES plants would be conducted before any projects could take place.

Grazing
Under Alternative D the grazing objective and standards, and the linkage standard are identical to those in Alternatives B and C, therefore the effects would be the same. Objective GRAZ O1 and Standards GRAZ S1 through S4 provide direction for the management of livestock grazing to assure the regeneration and sustainability of trees and shrubs. Standard LINK S2 requires the management of livestock grazing in linkage areas to contribute to maintaining or moving the shrub-steppe habitat to mid

or late serial stage. There are no grazing guidelines under Alternative D.

Many of the TES plants in the planning area depend on riparian areas, so the management of livestock grazing may prove beneficial to them in the long term. Applying Standard GRAZ S4 in *shrub-steppe* (dry places where grasslands are mixed with shrubs often including sagebrush) and Standard GRAZ S3 in wet areas would help recreate historic conditions.

Human uses
Under Alternative D, the objectives, standards, and guidelines are identical to those in Alternative C. As in Alternative C, the direction would limit the amount of disturbance allowed from special uses, mineral exploration, and development.

Any ground-disturbing activity that removes vegetation or soil, or fragments habitat, can affect TES plants. Alternative D should reduce these impacts.

Water howellia
Beneficial effects to water howellia may result in the long term if historic succession and disturbance regimes are restored. Although no vegetation activities would occur in water howellia habitat, the species would benefit indirectly through the maintenance of the historic hydrologic regime resulting from permitted vegetation treatments.

Ute ladies'-tresses
Beneficial effects to Ute ladies'-tresses may result in the long term if historic succession and disturbance regimes are restored. The grazing direction would benefit this riparian-dependent species.

Slender moonwort
There may be beneficial effects to slender moonwort from the management direction in Standard GRAZ S1 concerning young regenerating forests.

Alternative E

The effects of Alternative E are likely to be mostly beneficial to most TES plants. Alternative E is not expected to have any major effect on TES plant habitat. As with the other alternatives, site-specific analyses would be conducted for TES plants before any projects could take place.

Vegetation standards and guidelines
The VEG standards and guidelines limit the location or extent of vegetation management projects. Generally, these limitations would not adversely affect TES plants because they still constrain projects more than do the existing plans.

Standards VEG S1 through VEG S4
Under Alternative E, Standard VEG S1 is applied to individual LAUs or a combination of immediately adjacent LAUs, however the standard does not apply to collaborative fuel treatment projects. There is no Standard VEG S2. Standard VEG S3 is like Alternative C's however the standard in Alternative E does not apply to collaborative fuel treatment projects. Standard VEG S4 is included as part of Guideline VEG G7, same as Alternative D. (See Table 2-1 for the exact wording of each standard and guideline.) Generally, these limitations would not adversely affect TES plants because they constrain projects more than do the existing plans.

Standards VEG S5 & VEG S6
Under Alternative E, Standard VEG S5 would allow precommercial thinning only within 200 feet of administrative sites, dwellings, or outbuildings; for research studies or genetic tree tests; or for fuel treatment projects identified through a collaborative approach.

Standard VEG S6 is dropped and replaced with Guideline VEG G8. VEG G8 states vegetation management projects should provide habitat conditions through time that maintain winter snowshoe hare habitat… [and] should be used to improve lynx habitat where dense understories are lacking." In general, the guideline encourages projects to maintain or improve lynx foraging conditions.

Alternative E is not expected to have any major effect on TES plant habitat. As with the other alternatives, site-specific analyses would be conducted for TES plants before any projects could take place.

Grazing
Under Alternative E the grazing objective is the same as in Alternatives B, C, and D. The standards have been changed to Guidelines GRAZ G1 through G4, and LINK G2. Objective GRAZ O1 and Guidelines GRAZ G1 through G4 provide direction for the management of livestock grazing that should regenerate and sustain trees and shrubs in fire- and harvest-created openings. Guideline LINK G2 should continue to maintain the shrub-steppe habitat conditions that occurred under historic disturbance regimes.

Many of the TES plants in the planning area depend on riparian areas, so the management of livestock grazing may prove beneficial to them in the long term. Applying Standard GRAZ S4 in *shrub-steppe* (dry places where grasslands are mixed with shrubs often including sagebrush) and Standard GRAZ S3 in wet areas would help recreate historic conditions.

Human uses
Under Alternative E, the objectives and guidelines are identical to those in Alternatives C and D. Standards HU S1, S2, and S3 have been changed to guidelines. The direction would limit the amount of disturbance allowed from special uses, mineral exploration, and development.

Any ground-disturbing activity that removes vegetation or soil, or fragments habitat, can affect TES plants. Alternative E should reduce these impacts.

Water howellia
Beneficial effects to water howellia may result in the long term if historic succession and disturbance regimes are restored. Although no vegetation activities would occur in water howellia habitat, the species would benefit indirectly through the maintenance of the historic hydrologic regime resulting from permitted vegetation treatments.

Ute ladies'-tresses
Beneficial effects to Ute ladies'-tresses may result in the long term if historic succession and disturbance regimes are restored. The grazing direction would benefit this riparian-dependent species.

Slender moonwort
There may be beneficial effects to slender moonwort from the management direction in Standard GRAZ S1 concerning young regenerating forests.

Alternative F Scenario 1

Alternative F Scenario 1 would apply the management direction to all lynx habitat in LAUs. The effects of Alternative F are likely to be mostly beneficial to most TES plants and similar in effects to Alternative E.

Vegetation standards and guidelines
The VEG standards and guidelines limit the location or extent of vegetation management projects. Generally, these limitations would not adversely affect TES plants because they still constrain projects more than do the existing plans.

Standards VEG S1, S2, S5 & S6
Under Alternative F the VEG standards apply to all vegetation management projects and to fuel treatment projects *outside* the WUI. Fuel treatment projects within the WUI would follow Guideline VEG G10, which states, "Fuel treatment projects within the WUI as defined by HFRA should be designed considering standards VEG S1, S2, S5, and S6 to promote lynx conservation." The cumulative total of fuel treatment projects in the WIU that do not meet the vegetation standards shall not exceed 6 percent of mapped lynx habitat.

Standards VEG S5 & VEG S6
Under Alternative F, Standard VEG S5 applies to precommercial thinning and fuel treatment projects that use precommercial thinning to achieve objectives outside the WUI as defined by the HFRA. Precommercial thinning may occur within 200 feet of administrative sites, dwellings, and outbuildings; for research studies and genetic tree tests; for conifer removal and daylight thinning around aspen; for daylight thinning of rust-resistant white pine; to restore whitebark pine; or based on new information and a written determination that the project is not likely to adversely affect lynx, or the project would have a short-term adverse but long term benefit to lynx. This alternative would allow vegetation management projects to treat fuels and restore fire to the ecosystem in areas outside the WUI.

Under Alternative F Standard VEG S6 applies to all vegetation management projects and fuel treatment projects outside the WUI. Projects that reduce snowshoe hare habitat in multistory mature or late successional forest may occur only within 200 feet of administrative sites, dwellings, outbuildings, and special use permit improvements; for research or genetic tree tests; or for incidental removal during salvage.

Within the WUI, fuel treatment projects would follow Guideline VEG G10, which says fuel treatment project should be designed considering Standards VEG S1, S2, S5, and S6 to promote lynx conservation. The vegetation standards and guidelines under Alternative F are not expected to have any major effect on TES plant habitat beyond those effects already discussed in the existing plans. Site-specific analyses would be conducted for

TES plants before any site-specific projects could take place.

Grazing
Under Alternative F the grazing objective is the same as in Alternatives B, C, D, and E. As in Alternative E, the standards have been changed to Guidelines GRAZ G1 through G4, and LINK G2. Objective GRAZ O1 and Guidelines GRAZ G1 through G4 provide direction for the management of livestock grazing that should regenerate and sustain trees and shrubs in fire- and harvest-created openings. Guideline LINK G2 should continue to maintain the shrub-steppe habitat conditions that occurred under historic disturbance regimes.

Many of the TES plants in the planning area depend on riparian areas, so the management of livestock grazing may prove beneficial to them in the long term. Applying Standard GRAZ S4 in *shrub-steppe* (dry places where grasslands are mixed with shrubs often including sagebrush) and Standard GRAZ S3 in wet areas would help recreate historic conditions.

Human uses
Under Alternative F, Objectives HU O1 through O4 are identical to those in Alternative E. HU O5 has been rephrased to be clearer. As in Alternative E, Standards HU S1, S2, and S3 have been changed to guidelines. Guidelines HU O1 through HU G10 and HU G12 are the same as in Alternative E. Guideline HU G11 was rewritten from Alternative E to clarify that the guideline refers to *designated* play areas. The direction would limit the amount of disturbance allowed from special uses, mineral exploration, and development.

Any ground-disturbing activity that removes vegetation or soil, or fragments habitat, can affect TES plants. Alternative E should reduce these impacts.

Water howellia
Beneficial effects to water howellia may result in the long term if historic succession and disturbance regimes are restored. Although no vegetation activities would occur in water howellia habitat, the species would benefit indirectly through the maintenance of the historic hydrologic regime resulting from permitted vegetation treatments.

Ute ladies'-tresses
Beneficial effects to Ute ladies'-tresses may result in the long term if historic succession and disturbance regimes are restored. The grazing direction would benefit this riparian-dependent species.

Slender moonwort
There may be beneficial effects to slender moonwort from the management direction in Standard GRAZ S1 concerning young regenerating forests.

Alternative F would have a negligible effect on TES plants within the WUI. Most TES plants within this zone are generally the lower elevation and valley bottom species. Fuel reduction projects generally involve thinning and prescribed burning designed to reduce fuel loadings. The level of activities associated with fuel reduction projects is anticipated to provide minimal impacts to any existing TES plant populations that occur within the treatment zones. Treatments may

open up forest canopy or reduce shading for some species. Treatments may also result in localized dryer growing conditions for some species as soils are potentially exposed to more sunlight. However, the total impact of fuel reduction projects that do not meet the vegetation standards would be limited to 6 percent of lynx habitat in the planning area. The impact, therefore, would be negligible.

Alternative F is not expected to have any major effect on TES plant habitat. As with the other alternatives, site-specific analyses would be conducted for TES plants before any projects could take place.

Alternative F Scenario 2

Alternative F, Scenario 2 would have similar effects as described in Alternative F, Scenario 1 except the management direction would not have to be applied to the Nez Perce, Salmon-Challis, Beaverhead-Deerlodge, Bitterroot, Ashley and Bighorn NFs, and the disjunct mountain ranges on the Custer, Gallatin, Helena and Lewis and Clark NFs until these areas are occupied by lynx. On these units there would be no change in effects on plant resources from those of existing plans while they remain unoccupied. If the areas become occupied at a future time, then the effects on these units would be the same as Alternative F, Scenario 1.

Cumulative effects

Alternative A

The past, present, and reasonably foreseeable actions listed in Appendix L have generally benefited threatened, endangered, proposed, and sensitive plants by limiting disturbance. Since Alternative A would not change the existing plans it would not have any cumulative effects on threatened, endangered, and sensitive species plants beyond those of the current plans.

Alternatives B, C, D, E & F

Alternatives B and C could cumulatively result in the continued decline of whitebark pine in some areas because the use of prescribed fire and thinning would be precluded in winter snowshoe hare habitat. However, restoration activities outside winter snowshoe hare habitat could continue.

Alternatives D and F would allow restoration of whitebark pine using both precommercial thinning and prescribed fire as tools. Therefore, they would contribute to the restoration of this species.

The proposal using any of the action alternatives would, in addition to the past, present, and reasonably foreseeable actions listed in Appendix L, continue to benefit threatened, endangered, proposed, and sensitive plants. The proposal would incorporate landscape considerations into project planning, and could further limit disturbances that could affect plants especially in riparian habitats.

Range

Affected environment

An active grazing allotment is a place where a term grazing permit is in effect and where livestock grazing is expected to occur most years. Depending on how the allotment is classified and the language in the term grazing permit, this may consist of either cattle or sheep, or occasionally both. In general, the season of use extends from early June to late September, although this varies depending on elevation, plant communities, and management requirements.

The planning area contains 1,878 Forest Service grazing allotments. Of these, 1,420 or 75 percent contain habitat suitable for lynx, and 1,289 of these are active (Table 3-50). Table K-7 in Appendix K shows a breakdown by administrative unit. The Project Record (analysis/range-deis/data) contains more data and background information.

The analysis of active grazing allotments containing lynx habitat shows that:

- 23 percent have less than a quarter of their acreage in lynx habitat;
- 40 percent have more than a quarter but less than half of their acreage in lynx habitat;
- 37 percent have more than half of their acreage in lynx habitat; and
- 19 percent lack management strategies similar to the LCAS.

Effects

Livestock grazing can affect lynx in two main ways:

- Livestock grazing has contributed to a decline in aspen (USDA FS 1998). Aspen provide snowshoe hare habitat, and are often associated with riparian areas (LCAS).
- Livestock grazing may change the structure or composition of shrub-steppe habitats, changing their ability to support lynx and its prey (USDA FS 1998). Shrub-steppe habitats provide forage for lynx

Table 3-50. Grazing allotments overlapping lynx habitat

Number of allotments	1,878
Allotments with lynx habitat	1,420
Active allotments with lynx habitat	1,289
Active allotments with less than 25 percent lynx habitat	291
Active allotments with from 25 to 50 percent lynx habitat	522
Active allotments with more than 50 percent lynx habitat	476
Active allotments with lynx habitat with management strategies similar to the LCAS	1,040

prey, as well as cover for lynx movement (LCAS).

However, the FWS, using the best scientific and commercial data presently available, has no information to indicate that grazing is a threat to lynx at this time. While this information does not indicate that grazing is a threat to lynx conservation and recovery at this time, adverse effects to individual lynx could result from grazing activities.

Under term grazing permits, livestock is managed according to the objectives, standards, and guidelines in the existing plans. Objectives describe desired conditions for range management. Existing plan standards and guidelines provide sideboards for grazing, so the short-term effects are within limits that make it possible to achieve the long-term objectives.

Existing plan standards and guidelines may include restrictions about the length of the grazing season, allowable use, and residual stubble height. Annual management is specified in the annual operating instructions to the permittee.

Alternative A, no action

The no-action alternative would not change existing Plan standards and guidelines for grazing. Current livestock grazing practices would not change on Forest Service grazing allotments. Therefore, Alternative A would have no effect on the livestock grazing policies and practices.

Alternatives B, C & D

The Alternatives B, C, and D include one objective and five standards that concern managing livestock grazing to provide for lynx habitat needs (see Chapter 2, Table 2-1). These are Objective GRAZ O1, and Standards LINK S2, GRAZ S1, GRAZ S2, GRAZ S3, and GRAZ S4. These standards and the objective are identical in Alternatives B, C, and D. The impacts to grazing (discussed on next page) are the same among the three alternatives since there are no differences in the grazing standards in Alternatives B, C, and D.

Alternatives E & F Scenario 1

Alternatives E and F include one objective and five guidelines that concern managing livestock grazing to provide for lynx habitat needs. Alternative F Scenario 1 would apply the management direction to all lynx habitat in LAUs. The Objective GRAZ O1 is the same as the objective in Alternatives B, C, and D. In Alternatives E and F five guidelines have replaced the five standards found in Alternative B, C, and D. They are called Guidelines LINK G2, GRAZ G1, GRAZ G2, GRAZ G3, and GRAZ G4. The difference between the standards and the guidelines is the word *should* has been inserted into the four guidelines to indicate there is some flexibility in the use of the guidelines (see definitions of *standard* and *guideline* in the glossary).

The effects of Alternatives B, C, D, E & F Scenario 1 on grazing

The effects on grazing, whether from the standards or the guidelines, would be substantially the same. These standards and guidelines both focus on protecting woody growth (shrub and tree regeneration, healthy aspen and willow stands, and shrub-steppe habitats) in the grazing allotment. See Table 2-1 for the specific wording for each standard or guideline.

About 81 percent of the active grazing allotments within lynx habitat already have management direction that provides similar protection to what is proposed in this proposal (see Appendix L). Many existing plans have been amended to include such direction as found in the *Inland Native Fish Strategy* (INFISH) which applies to National Forests west of the Continental Divide, and the *Interim Strategy for Managing Anadromous Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, and Potions of California* (PACFISH), which applies to National Forests with anadromous fish.

Such existing direction includes requirements for maintaining and limiting livestock use in riparian areas. It generally provides enough direction to manage grazing so it does not adversely impact lynx habitat. Little change would be needed to meet the standards or guidelines proposed in this proposal.

For the 19 percent of active allotments in lynx habitat whose existing plans do not contain similar management direction — all of them east of the Continental Divide — the action alternatives would add direction to make sure livestock grazing management would maintain or enhance lynx habitat.

The bottom line is that any of the alternatives would have only minimal effect on livestock grazing operations. In specific instances where a potential exists for negative impacts to shrub and tree regeneration, healthy aspen and willow stands, or shrub-steppe habitats due to grazing, application of the standards or guidelines could result in a need to change some aspect of the present livestock management. In most cases, this would likely consist of changing the timing, intensity, duration, or frequency of livestock use in a specific area. In a very few cases, structural improvements, such as fences, may be required to make sure livestock could be managed to maintain woody plants in the grazing allotment. What would be needed in any particular allotment to satisfy the new standards or guidelines would require a site-specific analysis.

Alternative F Scenario 2

Alternative F, Scenario 2, would have similar effects as described in Alternative F, Scenario 1 except the management direction would not have to be applied to the Nez Perce, Salmon-Challis, Beaverhead-Deerlodge, Bitterroot, Ashley and Bighorn NFs, and the disjunct mountain ranges on the Custer, Gallatin, Helena and Lewis and Clark NFs until these areas are occupied

by lynx. Most of these areas are already have similar management direction as PACFISH and INFISH so little change is anticipated.

Cumulative effects

Alternative A

The past, present, and reasonably foreseeable actions listed in Appendix L have cumulatively limited or restricted where or how livestock grazing can occur, especially west of the Continental Divide. These actions in addition to social, market, and other forces have resulted in a slow downward trend in the number of grazing allotments. Alternative A would not add any additional standards or guidelines to the existing plans, and so, would not cumulatively add to existing impacts on grazing.

Alternatives B, C, D, E & F

The management direction, in addition to the past, present, and reasonably foreseeable actions listed in Appendix L, would further limit or add restrictions to grazing. In particular, choosing any of the action alternatives would extend the management direction that already is in place west of the Continental Divide to those allotments on the east side of the Continental Divide.

In areas west of the Continental Divide there would be very limited cumulative effects because most of the management direction proposed to protect woody plants is already included in existing plans. East of the Continental Divide, due to the cumulative addition of past, present, and reasonably foreseeable actions in conjunction with the management direction in this proposal, some change in livestock management may be necessary in order to protect woody growth. This may, to a very small amount, add to the slow downward trend in the number of cattle or sheep allowed on the allotments. However, cumulatively, livestock management would not be precluded.

Impact of lynx on the grazing industry

There has been concern voiced by some sheep ranchers about lynx killing sheep. The concern is that cumulatively, with wolves, bears, and other predators that are now being protected; any increase in the lynx population would put the ranchers out of business.

Due to the naturally low density of lynx (LCAS, Ruediger 2000, p. 1-5; Ruggiero et al, 2000, pp. 387 to 390), the rarity of lynx taking ungulates of any kind (cattle, sheep, horses, deer, goats, etc.) (Ruggiero et al, 1999, pp. 375 to 378), and the low number of allotments that have substantial amounts of lynx habitat (Table 3-50), conserving the lynx population in the planning area would not cumulatively add to the loss of sheep from predators in any measurable way.

Recreation

The Northern Rockies has some of the most pristine and scenic wild lands in the United States. The area receives several million visitors in all seasons of the year because of its beauty and uncrowded backcountry (USDA FS 1998).

This analysis focuses on effects on winter recreation, because the standards and guidelines in the alternatives would primarily affect winter activities. Recreational facilities designed for summer use have very little effect on lynx (LCAS, p. 2-9). Developing or expanding sites such as developed campgrounds and amphitheaters would need to consider movement needs for lynx, but none of the alternatives would preclude their development or expansion.

Special-use permits

People use public lands in many different ways. The FS requires specific approval for many of these uses. Normally public lands are not made available if needs can be met on nonfederal lands.

Each year, the FS receives thousands of applications from people who want to use public lands for agriculture, outfitting and guiding, recreation, cabins, lodges, ski areas, telecommunication, research, photography and video productions, water transmission lines, and road and utility rights-of-way.

A special-use authorization is a legal document, such as a permit, lease, or easement that allows occupancy, use, rights, or privileges on NFS lands. The authorization is granted to named person(s) for a specific use of a certain piece of land for a given period of time.

Travel plans

Management direction for winter recreation comes from the existing plans. Generally, they identify where motorized and non-motorized use may occur during what seasons, and they distribute lands into various allocations limiting and directing how those areas can be used.

About 55 percent of the lynx habitat is in non-development allocations, which include wilderness areas, wilderness study areas, proposed wilderness and roadless areas (see Table 3-1). Motorized use is not allowed in the more than five million wilderness-area acres of lynx habitat. Motorized winter recreation may be allowed in some roadless areas or wilderness study areas. FS units produce *access* and *travel guides* or *maps*. These maps usually include information about open and closed roads or trails and areas with travel restrictions.

Definitions

Designated over-the-snow routes are routes managed under permit, agreement, or by the FS, where use is to some extent encouraged either by on-the-ground markings or by publication in brochures, recreation opportunity guides or maps (other than travel maps), or in electronic media produced or approved by the FS. Routes may be marked on the ground

with blue or orange diamonds, bamboo wands, blazes, or difficulty markers.

Both groomed routes and the routes identified in outfitter and guide permits are designated by definition.

Groomed routes are designated over-the-snow routes on which the snow surface is packed, leveled, or scarified (with or without set tracks) by equipment towed behind a snowmobile or snow-cat. Businesses and groups do most of the grooming. Snowmobile or cross-country ski clubs often obtain permission through permits or agreements to groom certain winter trails. Snow roads maintained by permitted snow-cat tours are considered groomed routes.

Designated play areas are places specifically identified for winter recreation, such as tubing or snowmobiling, but not including developed ski areas.

Routes & areas open, but not designated, many of which are identified on travel maps, are open for winter use, but their use is not encouraged in any way. The routes are not marked on the ground; they are not identified in brochures or other media, except the travel plan map; they are not groomed; they are not under permit or agreement. Some of these routes and areas are routinely used; others are never accessed. The lynx management direction does not apply to routes and areas that are open to winter use but are not designated.

Areas of consistent snow compaction are places generally covered with snow during winter that are used enough to compact the snow so that individual tracks are indistinguishable. In such places, compacted snow is evident most of the time, except immediately after snowfall, within 48 hours. Such places can be areas or linear routes.

Compaction may be caused by any human activity. Areas are generally found near snowmobile or cross-country ski routes; in the nearby openings, parks, and meadows; or near ski huts, plowed roads, or winter parking areas.

Examples of area of existing snow compaction include:

- Some of the consistently used routes that are open for public use, but not groomed or designated;
- Sledding or snow play areas close to plowed roads;
- Helicopter landing sites regularly used for heli-skiing;
- Ends of the snow roads used for snow-cat tours; and
- Small lakes with little wind scour where people go ice fishing regularly.

Affected environment

Over-the-snow recreation

Snowmobile use has increased on federal lands over the past several years. Nationally, snowmobile use grew 34 percent from 1988 to 1995 (USDA 1997a), much faster than the overall population. Snowmobiling is the second most popular winter sport (Cordell 1999). Increased use has led to increased demands for expanded routes.

Table 3-51 shows the trend in the number of registered snowmobiles in planning area states. This information is useful in gauging the popularity of snowmobiling, an outdoor activity for which precise estimates of use over time are difficult to obtain. The data indicates an upward trend in all states of the planning area.

Snowmobile technology has changed rapidly in recent years, making larger, more powerful, and quieter machines available. These new machines let people access previously inaccessible backcountry.

Yellowstone National Park attracts thousands of winter visitors every year. Much of this use spills over onto adjacent NFs (BBER 1994; BBER 1998), particularly the Targhee and Gallatin NFs, which along with the Bridger-Teton NF reported the highest levels of snowmobiling in the planning area.

Routes & areas

People use snowmobiles, snow cats, snowshoes, cross-country skis, and dog sleds on winter trails.

More than 15,000 miles of over-the-snow routes lie within the planning area. Over 13,000 miles of these trails are on public lands managed by the FS; about 8,000 miles are designated over-the-snow routes in lynx habitat. About 4,500 miles in lynx habitat are groomed in any year; the remaining 3,500 miles are designated, ungroomed routes (see Table 3-52 on the following page). Table K-8 in Appendix K contains information by unit.

Table 3-51. Growth in number of snowmobiles registered by state

	Registered snowmobiles		Average growth	
	1989-1991	2000-2001	Registered snowmobiles	State population
Idaho	21,532 in 1991	38,158 in 2001	2.3%	2.5%
Montana	15,100 in 1991	24,600 in 2001	5.0%	1.2%
Utah	12,800 in 1990	29,400 in 2001	7.9%	2.6%
Wyoming	15,300 in 1989	18,200 in 2000	1.6%	0.8%

Data from Idaho Department of Parks& Recreation (2004); Montana Department of Fish, Wildlife & Parks (Walker 2002); Utah State Parks & Recreation Department (Hayes 2002); and Wyoming State Parks & Trails Department (Rapp 2002)

Table 3-52. Miles of designated & groomed winter routes & acres of designated play areas

	NF lands				
	Idaho	Montana	Utah	Wyoming	TOTALS
Miles* designated over-the-snow routes	7,250 mi	4,225 mi	125 mi	1,775 mi	13,375 mi
Miles designated over-the-snow routes in lynx habitat	4,075 mi	2,725 mi	125 mi	1,050 mi	7,975 mi
Average miles groomed/ year in lynx habitat	1,800 mi	1,680 mi	120 mi	875 mi	4,475 mi
Acres* of designated play areas in lynx habitat	0	4 in 4,050 ac	0	0	4 in 4,050 ac

*Miles and acres are rounded to the nearest 5

In the year 2000, about 3,500 miles of snowmobile trails were groomed in lynx habitat in Idaho and Montana, 900 miles in Wyoming, and 120 miles in Utah. This includes routes outside federal lands, but within the planning area perimeter (Buster, pers. com. & Cook, pers. com.). For the NFS land see Table 3-52 and Appendix K, Table K-8.

Which routes are groomed changes from year to year depending on snow conditions and funding.

In the planning area, money to pay for grooming snowmobile trails comes from state snowmobile registration funds and a small percentage of gasoline taxes. Wyoming also receives a small amount of money from winter trail-use fees.

Since 1990, the total miles of groomed snowmobile trails have remained fairly stable. For the next five years it is expected the trend would remain flat, because the amount of money available is not likely to increase substantially, and grooming costs are increasing (Buster, pers. com. & Cook, pers. com.).

Outfitter permits

A total of 359 permits or agreements authorize winter recreation in the planning area (see Table 3-53). Of these, 338 (94 percent) authorize activities in lynx habitat. See Table K-9 in Appendix K for a breakdown by unit.

Table 3-53. Number of recreation special use permits & agreements

	NF lands					
	Idaho	Montana	Utah	Wyoming	Idaho	TOTALS
All recreation permits & agreements	735	1114	24	849	0	2722
Winter recreation permits & agreements	86	121	2	150	0	359
Winter recreation permits & agreements **in lynx habitat**	77 (90%)	115 (95%)	2 (100%)	144 (96%)	0	338 (94%)

The Idaho Panhandle and Targhee NFs in Idaho; the Gallatin, Lewis and Clark, and Lolo NFs in Montana; and the Bighorn, Bridger-Teton, and Shoshone NFs in Wyoming have the most permits and agreements authorizing winter recreation in lynx habitat.

Winter outfitters and guides provide a service to people who lack the skills or equipment to participate in winter activities, such as snowmobiling, cross-country or helicopter skiing, and late winter/early spring big game hunting. They provide jobs and income to many small rural western communities.

The number of outfitter and guide permits, and their level of use has remained relatively steady over the past decade.

Generally, new permits or increases in service-days have been issued only when existing permits terminate, or when other outfitters decrease their permitted service-days.

A decade ago there was very little outfitted use during winter. Traditionally outfitters in the Northern Region offered hunting trips. Over the past five to ten years, public demands for family-oriented vacations have increased and the availability of game animals has decreased (Chris Ryan, pers. com.).

Outfitters have responded by diversifying their businesses and changing the season-of-use in their permits. This has caused an increase in outfitted snowmobiling, cross-country skiing, etc., during the last decade. However, the change in season-of-use has not resulted in major increases in overall outfitter-guide use.

Effects on over-the-snow recreation

The Proposed Action and alternatives represent programmatic decisions; therefore, they would have no direct effects on recreation. Any direct effects would occur later at the project level, when site-specific decisions were made. Any effects identified in this analysis would be indirect effects, which would occur later as an indirect result of this action.

Alternative A, the no action alternative
Under the no-action alternative, winter access and use, and outfitter-guide operations on NFS lands would be managed as they have been under the existing plans. Decisions related to access and issuing new or existing permits, would continue to be made at the local level.

Grooming winter trails is likely to remain at current levels for at least the next five years because the amount of money available for grooming is not likely to increase substantially (Jeff Cook, pers, com.). To increase user satisfaction, grooming would need to increase later in the decade to meet the continuing increase in demand. If this happens, at the end of the decade, groomed routes in lynx habitat may increase above the current 4,475 miles.

The Gallatin, Targhee, and Bridger-Teton NFs would continue to receive the most snowmobile use. Snowmobilers

who visit Yellowstone National Park would continue to spend multiple days on the adjacent NFs.

Public demand for outfitter services would continue to increase, and outfitter business growth would likely follow current trends. Outfitters could change their services toward winter use; they could groom more trails and increase the number of winter trips.

Where Alternatives B, C, D, E and F, the action alternatives, are to be applied

As far as snowmobile use is concerned, Alternatives B, C, D, E, and F apply only to designated over-the-snow routes (see Standard HU S1 and Guideline HU G11 in Table 2-1). They do not restrict areas shown as open for winter use on travel maps where that use is not encouraged. They do not affect the use of undesignated ungroomed areas. The management direction also would not affect existing local decisions about which areas are available for winter use as shown on travel maps. This proposal affects only decisions about designated routes inside lynx habitat.

It is important to understand that **none** of the alternatives close any area now open to winter or off-trail use. And none of the alternatives prohibit the expansion of grooming on designated but presently un-groomed routes (see explanation under Figure 3-6, page 285).

Alternative B, the Proposed Action
Alternative B would add management direction for designated and groomed routes by including Objective HU O1 and Standard HU S1 (see Table 2-1). Alternative B would allow increases in designated over-the-snow routes in an LAU, but only if the increases consolidate use and improve lynx habitat. The level of these designated routes would be maintained at about 8,000 miles (see Table 3-52). This would limit managers' flexibility when trying to accommodate increasing demands, because the limits for trail relocations or adjustments would be imposed *at a single LAU*, basically one watershed.

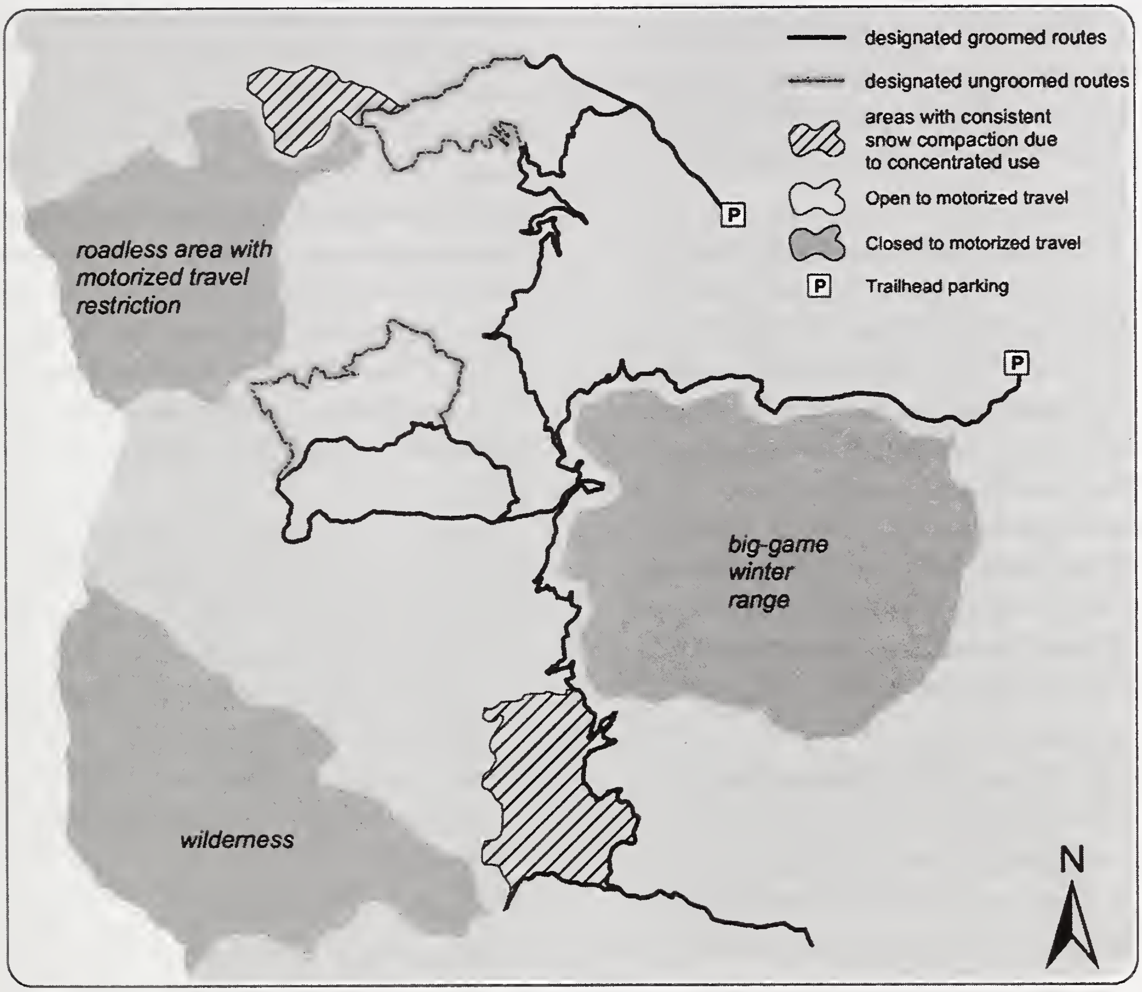
Grooming could expand on about 3,500 miles of designated ungroomed routes in lynx habitat - see Table 3-54. The Flathead, Gallatin, Targhee and Ashley NFs have only a limited ability to do more grooming because most of their designated trails are already groomed. Snowmobilers using Yellowstone Park tend to spill over on the adjacent Gallatin and Targhee NFs (see Appendix K).

Table 3-54. Designated over-the-snow routes available for future grooming

	Idaho	Montana	Utah	Wyoming
Miles designated over-the-snow routes	7,250 mi	4,225 mi	125 mi	1,775 mi
Miles designated over-the-snow routes in lynx habitat	4,075 mi	2,725 mi	125 mi	1,050 mi
Average miles groomed per year in lynx habitat	1,800 mi	1,680 mi	125 mi	875 mi
Miles designated trails in lynx habitat that are not groomed	2,275 mi	1,050 mi	0	175 mi
Percent designated in lynx habitat that is not groomed	55%	39%	0%	16%

Figure 3-6. Over the snow recreation

Map displaying how alternatives affect snowmobiling & cross-country skiing



Alternative A	Alternative B	Alternatives C, D, E & F
Does not close any areas now open to winter or off-trail use	Same as Alternative A	Same as Alternative A
Grooming could expand based on direction in existing plan	Grooming could expand on designated ungroomed routes	Grooming could expand on designated ungroomed routes & in areas of consistent snow compaction
Designated ungroomed routes could expand based on direction in existing plans	Designated ungroomed routes could not expand	Designated ungroomed routes could expand in areas of consistent snow compaction

This is not how snowmobile and cross-country ski routes are shown on visitor maps

New or expanded special use authorizations or agreements in lynx habitat would be limited to existing designated over-the-snow routes and areas. This would affect all units in the planning area, particularly the Gallatin, Idaho Panhandle, Targhee and Bighorn NFs, which have the most permitted outfitters.

Under Alternative B, use would likely increase on existing designated routes, changing user experience somewhat. For those users who enjoy seeing and meeting more users on routes this would be a more positive experience. For those users who desire a more solitary experience, the change would lessen the quality of their recreational experience to a small extent. Outside lynx habitat, the management direction would not limit anything.

Alternatives C & D
As with Alternative B, Alternatives C and D include Objective HU O1, but Standard HU S1 is changed as to where it is applied and to how it is apples to LAUs.

Alternatives C and D would allow increases in designated over-the-snow routes if the increases consolidate use and improve lynx habitat *in a fixed combination of immediately adjacent LAUs.* This would give managers more flexibility when trying to accommodate changes to the trail system by giving them a larger land area to consider.

As with Alternative B, grooming could expand on designated over-the-snow routes in Alternatives C and D. Currently there are about 3,500 miles of designated, ungroomed routes in lynx habitat across the planning area.

Alternatives C and D would increase the areas where special use permits or authorizations could expand. They could expand into *areas of consistent snow compaction* that are not currently designated or groomed. These are places that are already consistently used and compacted although the use has <u>not</u> been encouraged. They are shown as open for winter recreation on travel maps. These areas would be identified on a baseline map of areas or routes consistently used in 1998, 1999, and 2000.

In effect, Alternatives C and D would allow grooming to expand:

- On designated but presently ungroomed routes;
- When grooming consolidates use or improves lynx habitat; or
- Into areas of consistent snow compaction established in the baseline.

See Figure 3-6 on page 285.

Alternatives C and D would also allow designated un-groomed routes to expand:

- When designation consolidates use or improves lynx habitat; or
- Into areas of consistent snow compaction.

Alternatives C and D could result in an increase in designated over-the-snow routes, but should not result in more compacted snow since expansion would be into areas already compacted as established in the baseline. The newly designated routes could be groomed.

Outside lynx habitat, the management direction would not limit anything.

Since administrative units would be able to provide more designed and/or groomed routes and opportunities as demand increases, the recreational user's experience should not change under Alternatives C and D.

Alternatives E & F Scenario 1
Alternative F Scenario 1 would apply the management direction to all lynx habitat in LAUs. As with Alternatives B, C, and D, Alternatives E and F include Objective HU O1. However in place of Standard HU S1, Alternative E and F have Guideline HU G11 (see Table 2-1). Guideline HU G11 states, "Designated over-the-snow routes or designated play areas *should* not expand outside baseline areas…". The use of the word *should* allows for deviation from the guideline without amending the plan (see definitions of standard and guideline in the glossary). This allows for a little more flexibility in meeting the needs of lynx and the recreating public than Alternatives B, C, and D allow for. In other words, Alternatives E and F do not prohibit expansion of grooming beyond baseline areas; however, such expansion is discouraged by guideline HU G11.

Alternatives E and F would allow increases in designated over-the-snow routes if the increases consolidate use and improve lynx habitat *in a fixed combination of immediately adjacent LAUs*. This would give managers flexibility when trying to accommodate changes to the trail system by giving them a larger land area to consider.

As with Alternative B, C, and D, grooming could expand on designated over-the-snow routes in Alternatives E and F. Currently there are about 3,500 miles of designated, un-groomed routes in lynx habitat across the planning area.

Alternatives E and F would increase the areas where special use permits or authorizations could expand. They could expand into *areas of consistent snow compaction* that are not currently designated or groomed. These are places that are already consistently used and compacted although the use has <u>not</u> been encouraged. They are shown as open for winter recreation on travel maps. These areas would be identified on a baseline map of areas or routes consistently used in 1998, 1999, and 2000.

In effect, Alternatives E and F would allow grooming to expand:
- On designated but presently ungroomed routes;
- When grooming consolidates use or improves lynx habitat; or
- Into areas of consistent snow compaction established in the baseline.

See Figure 3-6 on page 285.

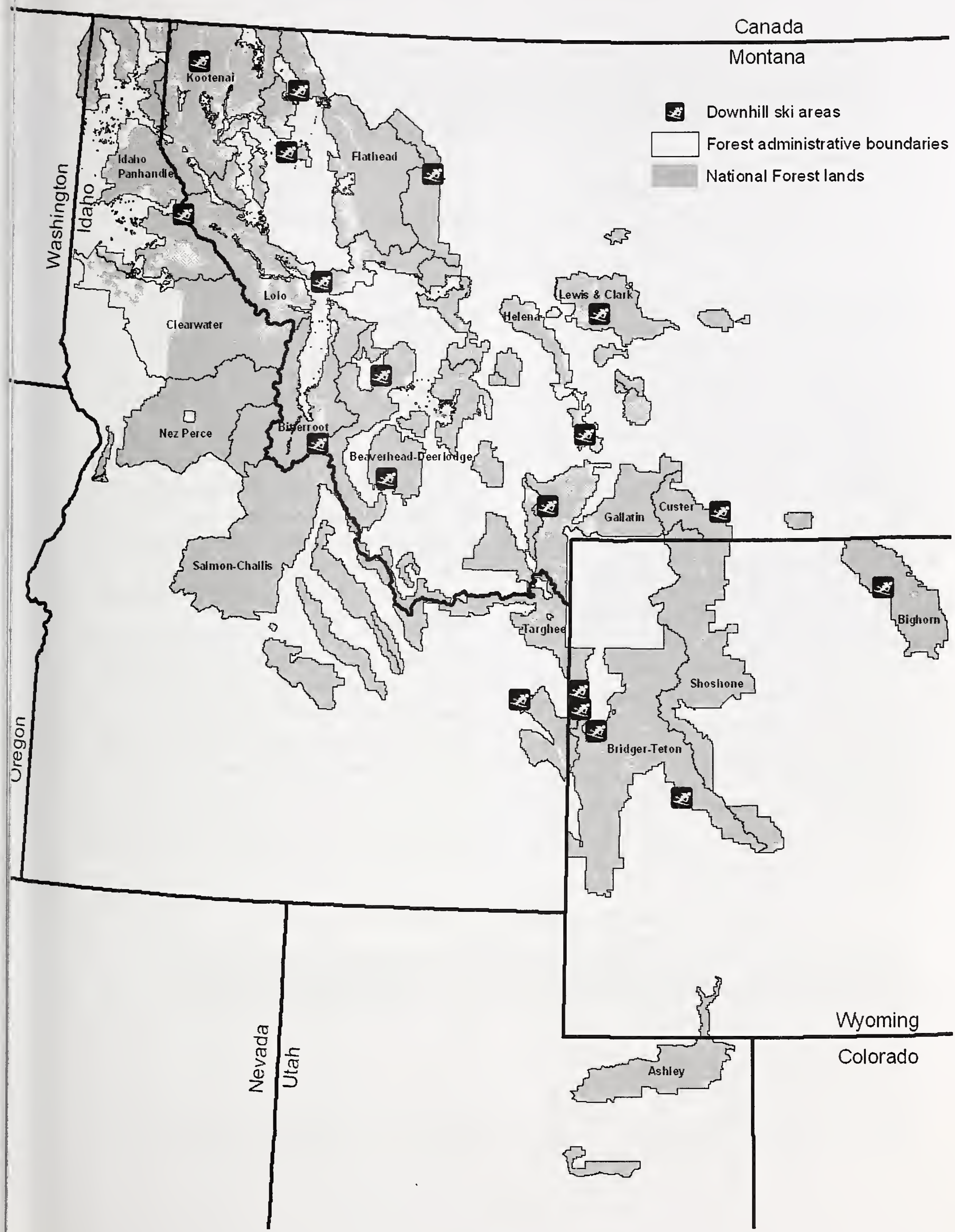
Alternatives E and F would also allow designated un-groomed routes to expand:
- When designation consolidates use or improves lynx habitat; or
- Into areas of consistent snow compaction.

Alternatives E and F could result in an increase in designated over-the-snow routes, but should not result in more compacted snow since expansion would be into areas already compacted as established in the baseline. The newly designated routes could be groomed. Outside lynx habitat, the management direction would not limit anything.

Since administrative units would be able to provide more designed and/or groomed routes and opportunities as demand increases, the recreational user's experience should not change under Alternatives E and F.

Alternative F Scenario 2
Alternative F, Scenario 2, would have similar effects as described above except the management direction would not have to be applied to the Nez Perce, Salmon-Challis, Beaverhead-Deerlodge, Bitterroot, Ashley and Bighorn NFs, and the disjunct mountain ranges on the Custer, Gallatin, Helena and Lewis and Clark NFs until these areas are occupied by lynx. Over-the-snow recreation could increase on these units. However, grooming winter trails is likely to remain at current levels for at least the next five years because the amount of money available for grooming is not likely to increase substantially. On these units outfitters could change their services toward winter use; they could groom more trails and increase the number of winter trips. If lynx are discovered later, the management direction would apply, but the effects would still be minimal because existing uses are not affected.

Figure 3-7. Ski areas in the planning area



Ski areas

The planning area contains 50 downhill and cross-country ski areas. Twenty-eight are in lynx habitat (see Table 3-55 for a breakdown of ski area type by state).

Downhill ski areas usually are highly developed recreation areas authorized by special use permits. Cross-country ski areas are usually less developed. In 1997, the FS conducted a nation-wide survey that found downhill ski visits increased by 58 percent, an increase even more dramatic than snowmobiling (USDA 1997a).

Snowboarding, the improvements in skis, and success in the 2002 winter Olympics, have all contributed to the expanding popularity of skiing. Increased use results in increased demand for more and larger ski areas.

With 5 each, the Flathead and Bridger-Teton NFs have the most permitted downhill ski areas in lynx habitat in the planning area (see Figure 3-7 and Table K-10). The Flathead, Bridger-Teton, Gallatin, and Targhee NFs have the most skiers, ranging from 175,000 to 433,000 visits per year. This is considerably more than the other units.

Effects on ski areas

Alternative A, no action
Under the no-action alternative, developed ski areas would be managed under the standards and guidelines found in the existing plans. There would be no direct or indirect effects on ski areas from Alterative A.

Alternatives B, C, D, E & F Scenario 1
There are no substantial differences in the effects on ski areas among Alternatives B, C, D, E, and F. All these alternatives would apply the management direction to all lynx habitat in LAUs.

The management direction would have no effect on existing ski areas. The management direction would be applied only to those ski areas planning expansions and the one new ski area that is in the very early planning stage (see Table 3-56 on next page). A private developer has suggested an additional

Table 3-55. Number of downhill & cross-country ski areas

	NFS lands				
	Idaho	Montana	Utah	Wyoming	TOTAL
Downhill and cross-country ski areas	6	23	0	21	50
Downhill ski areas in lynx habitat	3	11	0	4	18
Cross-country ski areas in lynx habitat	0	7	0	3	10
Acres of ski areas in lynx habitat	2,375 ac	13,860 ac	0	5,020 ac	21,255 ac

Table 3-56. Planned expansions or new ski areas during the next ten years

	NFS lands				
	Idaho	Montana	Utah	Wyoming	TOTAL
Ski areas planning expansion in lynx habitat	3	7	0	0	10
New ski areas planned in lynx habitat	0	1	0	0	1

new ski area on the Lolo and Bitterroot NFs. However, the Forests involved are in the forest planning revision process at this time, and it not clear how this suggested ski area would fit into future Forest Plans. No NEPA or planning concerning the suggested ski area has been done by the Forests at this time, so it would be premature to include the suggested ski area in Table 3-56. Regardless, any new ski area would also be required to follow the management direction.

The action alternatives all include the same objectives for managing developed areas in lynx habitat; Objectives HU O1, HU O2, HU O3, and HU O4 (see Table 2-1 in Chapter 2). These objectives describe desired landscape conditions, such as discouraging the expansion of snow-compacting activities, making sure future developments provide lynx landscape connectivity, and maintaining lynx habitat.

Alternative B includes Standard HU S2 that says, "When developing or expanding ski areas, locate trails, access roads and lift termini to maintain and provide lynx diurnal security habitat if its been identified as a need." If diurnal security habitat is identified as a need, this direction could affect what areas are available for ski runs and increase costs. Standard HU S2 is changed to Guideline HU G10 in Alternatives C, D, and E. Guideline HU G10 states, "When developing or expanding ski areas and trails, access roads and lift termini should be located to maintain and provide lynx diurnal security habitat, if identified as a need."

Under Alternative F the word *diurnal* has been removed because the real intent of this guidance is to provide some blocks of vegetation where lynx can hide—day or night.

In the planning area most ski areas are dispersed—meaning there are not several ski areas adjacent to each other in one location. Since these dispersed ski areas are surrounded by forest that provide places for lynx to hide security habitat within each ski area is likely not a need. In a few locations, where ski areas are more contiguous the design of new access roads and lift termini may need to consider lynx security habitat. This could increase costs associated with ski area expansion or development.

The action alternatives all include Guidelines HU G1, HU G2, and HU G3. HU G1 concerns providing inter-trail

islands for snowshoe hare habitat. HU G2 concerns providing nocturnal lynx foraging areas. In Alternative F the word *nocturnal* was dropped from Guideline HU G2 since there is no difference between daytime and nighttime foraging habitat. Guideline HU G3 concerns providing for lynx movement, and maintaining the effectiveness of lynx habitat. Each of these guidelines could affect the timing of operations and where ski runs would be located.

The management direction would not preclude further development, but would require that lynx habitat needs be considered in expansions or new ski areas.

Alternative F Scenario 2
In Alternative F, Scenario 2 management direction would not have to be applied to the six downhill ski areas located on the Beaverhead-Deerlodge, Lewis and Clark, Salmon-Challis/Bitterroot and Bighorn National Forests. One ski area on the Beaverhead-Deerlodge, one on the Lewis and Clark, and one on the Salmon-Challis/Bitterroot have expansions proposed. The management direction would not have to be followed for these two expansions, but should be considered. If lynx are discovered later, the management direction would apply, but the effects would still be minimal because these ski areas are generally isolated and meeting the management direction would not be difficult.

Cumulative effects

Alternative A, no action
It is likely the demand for both developed and dispersed winter recreation would increase during the next decade. The past, present, and reasonably foreseeable future actions identified in Appendix L may limit where winter recreation activities may occur and expand.

There is some potential to expand use on public lands and maintain the present level of visitor satisfaction. Solutions to resolve conflicts between motorized and non-motorized users could include expanding use to places currently free from human-caused snow compaction, if allowed in existing plans. However, since Alternative A would not add any more standards or guidelines, it would not have any direct or indirect effects on ski areas; therefore, Alternative A would not cumulatively affect developed and dispersed winter recreation.

Alternatives B, C, D, E & F
Given the expected increase in demand for winter recreation, cumulatively the management direction, in addition to the past, present, and reasonably foreseeable future actions identified in Appendix L, may affect the area available for snow-compacting winter recreation. This likely would be the case for both developed and dispersed winter recreational pursuits. This could result in changes in user experience.

Under Alternative B the management direction would not change existing

opportunities; however, it is likely an increased number of people would be using existing areas. This could result in changes in user experience. For example, people would likely encounter more traffic, especially on groomed trails and in developed recreation sites. For those seeking a solitary experience the change would be a negative one. For those seeking a group-type of experience the change could be a positive one. In addition, with increased use safety issues associated with more people using the same trail at the same time could arise.

Under Alternatives C, D, E, and F the potential adverse effects to recreational users would be less because more options are available to meet user needs.

Grooming could increase on most units under Alternative B, and on all units under Alternatives C, D, E, and F. Designated *ungroomed* routes could <u>not</u> expand under Alternative B, but could expand into areas of existing consistent snow compaction under Alternatives C, D, E, and F. Therefore, Alternatives C, D, E, and F are likely to have less cumulative effect on user experience because more opportunities to meet increased demand would be available.

The use of the guidance for developed ski areas, cumulatively with those actions identified in Appendix L and in addition to various market factors, could increase costs, affect the timing of operations, and affect where future ski areas and runs would be located. These cumulative effects would not preclude further development of developed ski areas.

Transportation

Highways

Affected environment

Highways typically follow natural features such as lakes, rivers, and valleys. They can directly affect the amount of winter snowshoe hare and denning habitat available by converting forests into road surfaces, rights-of-way, and the associated maintenance facilities and gravel pits (LCAS, p. 2-17).

Highways can alter landscapes by fragmenting large tracts of land. As the standard of road increases from gravel to two-lane highway, traffic volume increases. According to the LCAS, lynx may become intimidated by traffic and may not cross highways when the volume reaches from 2,000 to 4,000 vehicles per day, particularly if traffic continues during the night. Parts of various highways traverse lynx linkage areas (see Table 3-57). All the highways in the linkage areas, including most major highways in Idaho, western Montana, western Wyoming, and northern Utah, were considered in this analysis. Linkage areas were identified at interagency meetings held in planning area states in 2001 and 2002 (see Appendix B).

The degree of impact increases as highways are upgraded from two lanes to four. Four-lane highways commonly have fences on each side, service roads, paralleling railroads and other impediments such as 'Jersey barriers' that make crossing even more difficult. While the FS does not have authority over these highways, if a right-of-way is involved, they can influence the consideration of wildlife crossings. Table 3-58 on the next page shows highways that have been upgraded from two lanes to four during the last decade and those planned during the next decade.

Beginning in the fall 2004 and expecting to continue through the fall of 2009, major improvements on a 56-mile stretch of US Highway 93 in Montana from Evaro to Polson is under construction. Thirteen miles from Ronan to Polson are being widened to four lanes. A third lane is being added to parts of the remaining 43 miles. The Evaro portion is part of a lynx linkage area.

The reconstruction includes wildlife

Table 3-57. Highways in lynx linkage areas

	Interstate highways	US highways	State highways
Idaho	I-15 & I-90	US 2, 12, 26, 30, 93 & 95	ID 75
Montana	I-15 & I-90	US 2, 12, 89, 93, 187, 191,212, 287 & 310	MT 37, 43, 56, 72, 83 & 200
Utah	I-80	US 40	n/a
Wyoming	n/a	US 14, 16, 20, 26, 28, 30, 189, 191 & 212	WY 28

crossings and fencing to help wildlife move across the highway. The wildlife measures would increase the cost of the project by five to eight percent.

An interagency group, including Federal and State agencies, is also beginning to look at the proposed road project on Montana Highway 83 though the Seeley-Swan Valley. The Seeley-Swan Valley is a lynx linkage area. The project would follow the proposed management direction and likely include designed to lessen the impact on wildlife. The beginning of any NEPA analysis on the Highway 83 improvements is probably five to ten years out. At this time this project is too speculative to add it to Table 3-58.

The states of Idaho, Montana, Utah, and Wyoming all are evaluating ways to provide wildlife crossings and implementing their findings in their highway reconstruction plans (Wyoming Department of Transportation, 2005; Idaho Transportation Department 2004; Montana DOT, FHWA, Confederated Kootenai and Salish Tribes 2006).

In addition, the FS is part of the steering team that produced the document entitled *Eco-Logical: An Ecosystem Approach to Developing Infrastructure Projects* (USDOT, 2006). It embodies the intent and principles of the NEPA and Executive Order 13352 on Facilitation of Cooperative Conservation, and offers a framework for achieving greater interagency cooperative conservation. *Eco-Logical* provides a nonprescriptive approach that enables Federal, State, tribal and local partners involved in infrastructure planning, design, review, and construction to work together to make infrastructure more sensitive to wildlife and their ecosystems. It recognizes open public and stakeholder involvement as the cornerstone for cooperative conservation.

Effects

Table 3-58 shows the highways planned to be widened in lynx linkage areas over the next ten years.

Table 3-58. Highways upgrading from two to four lanes

Highway #	Reconstructed during last 10 years	To be reconstructed in next 10 years	In lynx linkage area?
Idaho			
US 95	MP* 508.1 to MP 510.6, near Bonners Ferry	n/a	no
US 95	n/a	MP* 522.2 to MP 527.25	no
US 95	n/a	MP 537.85 to MP 538.6, the Canadian border	yes
Montana			
US 2	Kalispell, 4.73 miles	n/a	no
US 93	Florence to Lolo, 23.4 miles	n/a	no
US 93	Somers intersection of Highway 82 N, 4 miles	n/a	no
US 93	Evaro to Polson, 56 miles (started)	Evaro to Polson, 56 miles (cont.)	yes
US 93	n/a	Hamilton to Florence, 11.6 miles	no
Wyoming			
US 30	n/a	Junction I-80 to Idaho state line, 100+ miles	yes

*MP = mile point

(Ebret, Smith, Rains, Watson & Milburn, pers. com.)

Alternative A, no action

Under the no-action alternative, no changes would be made to plans that would require agencies to consider lynx habitat connectivity. Methods to provide safe wildlife crossings are being researched by all the state highway organizations in the planning area, and are being incorporated into highway improvements. These methods may or may not be used in FS projects or incorporated into plans.

Alternatives B, C, D, E, and F Scenario 1

The management direction for highways under alternatives B, C, D, E and F Scenario 1 applies to linkage areas and wildlife crossings on all units. The direction is found in Objectives ALL O1 and HU O6, Standard LINK S1, and Guideline ALL G1 (see Table 2-1 in Chapter 2). These objectives, the standard, and the guideline are identical for all of the action alternatives.

Objective ALL O1 concerns maintaining or restoring habitat connectivity. Objective HU O6 concerns reducing adverse highway effects by working cooperatively among agencies to provide lynx movement and habitat connectivity. Standard LINK S1 states, "When highway or forest highway construction or reconstruction is proposed in linkage areas, identify potential highway crossings." Guideline ALL G1 states, "Methods to avoid or reduce effects on lynx should be used when constructing or reconstructing highways or forest highways across federal land. Methods could include fencing, underpasses or overpasses."

Linkage areas for lynx already have been identified and mapped (see Figure 1-1). State and federal highway officials are using this data to identify potential wildlife crossings.

Highway programs in the planning area already have incorporated some wildlife crossings into their designs, so this standard may not cause any changes beyond what is already being done.

The management direction would place more emphasis on wildlife crossings and may result in higher construction costs. However, following this direction during highway planning and construction should facilitate wildlife movement though transportation corridors, thereby reducing collisions with wildlife. Reducing collisions would reduce injuries to, and deaths of wildlife and people.

Alternative F Scenario 2

The management direction regarding transportation would not have to be applied to Nez Perce, Salmon-Challis, Beaverhead-Deerlodge, Bitterroot, Ashley and Bighorn NFs, and the disjunct mountain ranges on the Custer, Gallatin, Helena and Lewis and Clark NFs until these areas are considered occupied. However, methods to provide safe wildlife crossings are being researched by all state highway organizations and are being incorporated into highway improvements at this time, regardless of whether lynx are present or not. If lynx are discovered later, the management direction would apply, but the effects would still be minimal because wildlife crossings are generally being incorporated into highway design.

Forest roads

Besides the law and regulations discussed in Chapter 1 *Legal background*, the following direction applies to forest roads:

36 CFR 212 – Administration of the forest transportation system
Adopted in January 2001 after the LCAS was finalized, this policy directs the FS to maintain a safe, environmentally sound road network that responds to public needs and is affordable to manage. The policy includes a science-based process called *Roads Analysis*, designed to help managers make better decisions about roads.

Public Forest Service Roads
In December 2000, the FS proposed designating most of its arterial and collector roads as *public roads*, which would be open and available to the public on a regular and consistent basis, as defined in 23 U.S.C. 101 (USDA FS 2000b).

Affected environment

The planning area contains more than 15,000 miles of open roads in lynx habitat (Table 3-59). Roads can directly affect the amount of denning and foraging habitat available by removing forest cover.

According to the LCAS, lynx may use little-traveled roadways for travel and foraging in good snowshoe hare habitat. However, they seem to prefer to move through continuous forests, and frequently use ridges, saddles, and riparian areas.

Lynx may tolerate some level of human disturbance. Road density does not appear to affect lynx habitat selection (LCAS, p. 12).

While displacement by humans does not appear to be a major factor, access via roads may increase the mortality risk to lynx from incidental trapping or illegal shooting, and by allowing competing carnivores, such as coyotes and mountain lions, access into lynx habitat in winter on snow-compacted roads or trails.

In the planning area, 8,665 miles of open forest road in lynx habitat are maintained for high-clearance vehicles (*maintenance level* 2) and another 6,930 miles of open road are maintained for low-clearance vehicles (*maintenance levels 3 to 5*) (see Table 3-59). (Project file, Analysis /Transportation-DEIS provides information regarding this data.)

Present FS policy is to reduce the amount of open roads in maintenance levels 2 through 5, and to improve roads left open to reduce effects.

New forest road construction has been

Table 3-59. Miles of forest road in lynx habitat in the planning area

Maintenance level 2 (suitable only for high-clearance vehicles)	8,665 miles
Maintenance levels 3 to 5 (suitable for low-clearance vehicles)	6,930 miles
Paved to two or more lanes, last *decade*	15 miles
New & open, last *five years*	15 miles
‡Paved for resource reasons, last *five years*	2 miles

‡One-lane roads with low traffic

drastically reduced during the last decade (USDA FS 2000b). Most road building is for timber harvest, and very few of the roads are left open after the logging is done. Some new roads have been built to access campgrounds. Only 15 miles of roads built in lynx habitat during the past five years are open to public use.

Many FS roads have heavy public use, and meet the use-and-needs criteria for county or state jurisdictions. In lynx habitat, about 15 miles of heavily used roads have been paved to two lanes during the last decade (see Table 3-59 on the previous page). The jurisdiction of these roads is usually turned over to state or county public road agencies to maintain after they are built.

Some low-traffic, one-lane roads are paved to reduce the sediment delivered to streams. In these cases, the traffic level is not considered high enough to justify paving, and the roads are not considered public roads. See Tables K-12 and K-13 in Appendix K for a display of roads by administrative unit.

Effects

Alternative A, no action

Under the no-action alternative, no changes would be made to plans that would require the FS to consider lynx when considering forest roads.

Regardless of this proposal, the theme for the FS is fewer and better roads. The trend is to continue to minimize development, to classify existing roads as either needed or unneeded, and to decommission unneeded roads. Many of the remaining roads are targeted for improvement to make them comply with standards for safety and environmental protection.

A Roads Analysis would be done before any work was done on FS roads. The analysis would identify resource concerns so projects would address those concerns.

Table 3-60 shows the actions planned for forest roads in lynx habitat if budgets permit. During the next *decade*:

- About 45 miles may be widened to two lanes and paved to improve safety, air quality, and to reduce the sediment delivered to streams.
- Seven miles may be built on ridge-tops and left open. Ridge-tops are a much-preferred road location. Roads built on ridge-tops generally have less drainage problems with fewer culverts and ditches to maintain. The area exposed by cut-and-fill slopes is minimized, leaving less area open to slides.

Table 3-60. Future forest roads in lynx habitat in the planning area

Planned to be paved to two or more lanes, next *decade*	45 miles
Planned on ridge-top & open, next *decade*	7 miles
Planned new & open, next *five years*	5 miles
Planned to be upgraded, next *five years*	237 miles
‡Planned to be paved for resource reasons, next *five years*	2 miles

‡One-lane roads with low traffic

Future activities are estimates and are subject to change.

See Appendix K-Tables K-12 and K-13 for breakdown by National Forest

During the next *five* years:

- About five miles may be built and left open, mostly to serve recreational needs.
- About 240 miles may be improved, to reduce dust and stream siltation, straighten curves, widen roadways, add turnouts, improve drainage facilities, and eliminate safety hazards. This work would improve traffic flow, increase design speed, increase safety, and accommodate expected traffic increases.
- Two miles may be paved to reduce the sediment delivered to streams.

Alternative B, the Proposed Action

Alternative B proposes only guidelines for forest roads (see Table 2-1 in Chapter 2). A guideline is a management action that should be used to meet an objective found in a plan. Guidelines may be deviated from if reasons can be documented.

Guideline ALL G1 states, "Methods to avoid or reduce effects on lynx should be used when constructing or reconstructing highways or forest highways…". Most of these construction or reconstruction projects are short distances on low traffic roads with little impact on wildlife. In these circumstances, this guideline would have little to no impact on the project. But where traffic is heavy or the project distance is long, heightened awareness about wildlife impacts and Guideline ALL G1 would lead to investigating fencing and wildlife underpasses or overpasses to reduce the risk of mortality. This would add to the cost of road construction or reconstruction. The increase in cost would be dependent on many site-specific factors, including location, habitat, road type, number of know wildlife crossings, and the feasibility of using fencing and wildlife underpasses or overpasses.

Guideline HU G6 would discourage upgrading unpaved roads to *maintenance level 4 or 5*. (These maintenance levels provide a moderate to high degree of user comfort. Most level 4 roads have double lanes and an aggregate surface. Level 5 roads have double lanes and are paved.) Disallowing upgrades may compromise safety, reduce air quality, and increase the sediment delivered to streams. As the population grows and more people look to the outdoors for recreation, traffic may well increase even if roads are not improved, which could increase the potential for accidents.

Over the next 10 years 45 miles of paving are planned. This is 0.3 percent of the 15,000 miles of open roads in lynx habitat in the planning area. Two miles of paving for resource reasons are planned during the next five years. One mile may be paved to reduce the sediment delivered by a road located beside a stream in bull trout habitat. (Bull trout is federally listed as a threatened species under the Endangered Species Act.)

Guideline HU G6 also may affect the almost 240 miles of upgrades planned during the next five years. Changes are planned in road alignment and surfacing that would change traffic flow, decrease dust in the air and the sediment delivered to streams, increase design speed and safety, and accommodate more traffic. These improvements would have to be justified for the work to go forward. This guideline may slow or deter the paving or

upgrades of these roads. However most, if not all, of these roads lack the traffic volume that would make them a concern or threat to lynx as described in the LCAS.

Guideline HU G7 states that new permanent roads should be situated away from forested stringers, because forested stringers may be important for lynx habitat connectivity. This guideline could affect the ten miles of new permanent road construction planned for the next five years. If these roads were planned to be located near forested stringers, they could impact lynx habitat. Building them in such locations would have to be justified in the site specific analysis.

Guideline HU G7 also discourages building new roads on ridge-tops and or saddles, or in areas identified as important for lynx habitat connectivity. In the next decade, five miles of such roads are planned. The alternate location for these roads is on side-slopes averaging 40 percent. Roads built on ridge-tops generally have less drainage problems with fewer culverts and ditches to maintain than those built on side slopes. The area exposed by cut and fill slopes is minimized on ridge tops, leaving less area open to slides.

Guideline HU G8 would minimize roadside brush cutting, which could increase accidents and animal mortality by reducing the sight distance and the time animals are visible to motorists. However, brush cutting can also result in more big game browsing on the brush next to roads.

Guideline HU G9 would restrict public use on new roads built for projects. Only ten miles of new road construction is planned to be left open during the next five years. Leaving these miles open would have to be justified.

Alternatives C, D, E & F Scenario 1

For forest roads and highways, Alternatives C, D, E, and F have the same guidelines as Alternative B except for Guideline HU G6. All these alternatives apply to lynx habitat on all units. In Alternative C, D, E, and F *Guideline HU G6* has been modified to encourage the use of mitigation measures when roads are being upgraded. Guideline HU G6 would encourage the use of wildlife crossings and fencing to reduce or avoid the mortality caused by collisions.

The effects of these guidelines would be a need for additional analysis keeping impacts to lynx in mind, possibly the change in road locations, and possibly the reconsideration of some road improvements. If roads are upgraded, the use of methods to reduce or avoid effects to lynx may slightly increase the cost of the project. Given the small number of roads being affected and those roads being spread over a large area and numerous administrative units, the indirect impacts overall to the transportation system would be minor.

Alternative F Scenario 2

The management direction regarding forest roads would not have to be applied to Nez Perce, Salmon-Challis, Beaverhead-Deerlodge, Bitterroot, Ashley and Bighorn NFs, and the disjunct mountain ranges on the Custer, Gallatin, Helena and Lewis and Clark NFs until these areas are considered occupied.

On the Nez Perce NF only 7 miles are planned to be paved over the next five years. On the Salmon-Challis NF 12 miles are planned for upgrades over the next five years. On the Beaverhead-Deerlodge NF 5 miles are planned to be paved, 2.4 miles of new roads are planned for construction and may remain open, and 1.5 miles are planned for upgrades over the next five years. On the Bitterroot NF no changes are anticipated. On the Ashley NF about 2 miles are planned to be paved and an additional 2 miles are planned for upgrades over the next 5 years.

On the Custer NF about 6.6 miles are planned to be paved and 14 miles planned for upgrades in lynx habitat; on the Helena NF about 5 miles are planned to be paved and 20 miles are planned for upgrades; and on the Gallatin 8 miles are planned to be paved and 5 miles are planned for upgrades; however it is unknown if these actions are in the area unoccupied by lynx (see Appendix K, Table K-12 and K-13).

Management direction would not have to be followed in the design of these actions. A Road Analysis would still be done prior to any work on NF roads. If lynx are discovered later, the management direction would apply, but the effects would still be minimal.

Cumulative effects

Highways

Alternative A

The past, present, and reasonably foreseeable actions listed in Appendix L have had a limited effect on highways except to incorporate management direction related to stream and river crossings. The No Action Alternative would not add any cumulative effects to these.

Alternatives B, C, D, E, and F

In addition to the past, present, and reasonably foreseeable actions listed in Appendix L, the proposal would add more management direction for considering highway crossings for wildlife. Cumulatively this would increase costs. How much costs would increase are dependant upon the site-specific situation for each highway, and what decisions are made to incorporate wildlife structures into highway designs.

Roads

Alternative A

The past, present, and reasonably foreseeable actions listed in Appendix L have cumulatively changed the emphasis of road management, away from constructing roads, and towards keeping and improving needed roads while decommissioning unneeded roads.

Alternatives B, C, D, E, and F

Cumulatively, the proposal in addition to the past, present, and reasonably foreseeable future actions identified in Appendix L, would limit new roads open to the public in lynx habitat. The proposal would require further analysis and consideration for upgrading roads, especially those that increase traffic volumes or speeds, which could result in increased costs.

These alternatives could also cumulatively increase the number of roads that are decommissioned.

Minerals

A wide variety of mineral and energy resources occur on planning area lands. The authority of the FS to manage mineral activities depends on the commodity and the legal status of the lands on which they occur. The data for all of the mineral related information may be found in Project Record/Analysis/Minerals-DEIS and FEIS/data.

Definitions

Surface-disturbing activities associated with mineral and energy resources typically include:

Prospecting
Prospecting is identifying an area with potential for mineral development. It involves limited surface disturbance, such as geologic mapping, or soil or water sampling. Prospecting for oil and gas often involves collecting seismic data.

Exploration
Exploration is physically searching for minerals. It often includes building roads, drill pads, underground workings, and trenching.

Development
Development is the work required to prepare a mineral deposit for production. It may include driving underground workings, stripping the overburden from deposits that would be open-pit or strip mined, building waste dumps, and constructing milling and transporting facilities.

Oil and gas development includes drilling a series of production wells and building access roads.

Production
Production is removing a mineral from the ground and making it available for final processing and consumption.

Reclamation
Reclamation is restoring the areas disturbed during exploration, development, and production.

Management constraints

The *status* of the land affects the legal authorities that apply to management and disposal of minerals. Land is in one of the following *status* categories:

- Lands reserved from the public domain;
- Acquired lands;
- Lands with outstanding or reserved rights; or
- Private land with federally owned minerals

Mineral resources may be classified into three categories:

- Mineral materials;
- Locatable minerals; or
- Leasable minerals

The combination of land status and the type of mineral resource define the agency's management authority.

Mineral materials

Affected environment

Mineral materials are common minerals such as stone, gravel, clay, cinders, and decorative rock, whose disposal is authorized under the Materials Act of 1947. This act provides for disposing of mineral materials on public lands through bidding, negotiated contracts, or free use. The FS has full authority to make decisions about disposing of mineral materials on lands of all status categories.

The FS uses mineral materials from NFS lands for building and surfacing system roads. The FS may sell these mineral materials, or issue free-use permits to state and county governments for public projects such as highway construction and maintenance. All contracts contain requirements for reclaiming sites to pre-mining conditions as much as possible.

There are about 2,600 active mineral-material sites on NF lands in the planning area. In fiscal year 2000, about 800,000 tons of mineral materials worth more than $2.8 million were removed from these lands. About a quarter was removed by the FS for its own use. Demand for mineral materials is expected to grow as demand increases for public and private infrastructure. The largest increases have been for the very small, free use permits issued to private individuals for a ton of material or less (a pick-up load). These free use permit sites rarely result in a pit or need more than minor reclamation.

Excavation, temporary storage, and transport are associated with removing mineral materials at some sites. Typically, sites are small, less than five acres. Most are near or next to roads and do not require substantial amounts of new road. The small, free use permits are almost all next to existing roads.

Mineral material sites seldom overlap the high-elevation, remote places where lynx habitat occurs. Only two to three percent of mineral-materials sites permitted in the last 15 years were in lynx habitat. Presently, only one mineral-material site in lynx habitat has winter operations. We anticipate this proportion would continue in the future.

Effects

Alternative A, the no action alternative
Management direction about mineral materials would not be changed under the no-action alternative, so there would be no effect to the use or availability of mineral materials.

Alternatives B, C & D
Alternatives B, C, and D add management direction including Objective HU O5; Standards ALL S1 and HU S3; and Guidelines HU G4, HU G5, and HU G9 (see Table 2-1 in Chapter 2). Objective HU O5 is concerned with managing activities such as exploring and developing minerals/oil and gas wells to reduce impacts to lynx and lynx habitat. Standard ALL S1 is concerned with maintaining habitat connectivity in new or

expanded permanent developments. Standard HU S3 is concerned with limiting winter access to the use of designated routes for exploration and development.

Guideline HU G4 encourages the use of remote monitoring to reduce snow compaction. Guideline HU G5 encourages reclamation plans to restore lynx habitat. And Guideline HU G9 encourages the closure and reclamation of project roads. Basically this direction is about road use and requires considering lynx habitat needs during mineral exploration, development, and site reclamation.

Alternative E
In Alternative E, Objective HU O5; Standard ALL S1; and Guidelines HU G4, HU G5, and HU G9 (see Table 2-1 in Chapter 2) remain the same as they are in Alternatives B, C, and D. However, in Alternative E, Standard HU S3 is changed to Guideline HU G12.

Like Standard HU S3, Guideline HU G12 is concerned with limiting winter access to the use of designated routes for exploration and development. But rather than *requiring* that exploration and development activities stay on designated routes, the guideline says they *should* be limited to designated routes. This adds some flexibility in conducting winter exploration and development activities while still meeting the objective of reducing impacts to lynx and lynx habitat.

Alternative F Scenario 1
Alternative F Scenario 1 would apply the management direction to all lynx habitat in LAUs. In Alternative F, Objective HU O5 is rephrased, but the meaning is the same as in Alternatives B, C, D, and E.

In Alternative F Standard ALL S1 is somewhat narrowed in its scope. In Alternative F the standard requires the maintenance of habitat connectivity *in those areas that are identified as Lynx Analysis Units or linkage area*s. This change focuses the standard on those areas that are important to lynx.

As in Alternative E, Alternative F has replaced Standard HU S3 with Guideline HU G12. Guideline HU G12 is concerned with limiting winter access to the use of designated routes for exploration and development. But rather than *requiring* that exploration and development activities stay on designated routes, the guideline says they *should* be limited to designated routes. This adds some flexibility in conducting winter exploration and development activities while still meeting the objective of reducing impacts to lynx and lynx habitat.

Guidelines HU G4, HU G5, and HU G9 in Alternative F are the same as in the other action alternatives.

The effects of any of the action alternatives (Alternatives B, C, D, E, or F) on expansion or further development of existing sites would be minimal, because most sites are accessed by already existing roads and the sites are not in lynx habitat. The effects on new developments in lynx habitat would, likewise, be minimal because the developments are generally small, the road use requirements already exist, and adjusting the management to meet any new standards and guidelines from the proposal could be readily done

without unduly affecting the development of mineral material sites.

Alternative F Scenario 2
Management direction, Objective HU O5, Standard ALL S1, and Guideline HU G3 would not have to be applied to Nez Perce, Salmon-Challis, Beaverhead-Deerlodge, Bitterroot, Ashley and Bighorn NFs, and the disjunct mountain ranges on the Custer, Gallatin, Helena and Lewis and Clark NFs until these areas are considered occupied. There would be no effect to the use of or availability of mineral materials. If lynx are discovered later, the management direction would apply, but the effects would still be minimal because the developments are generally small, the road use requirements already exist, and adjusting the management to meet any new standards and guidelines could readily be done.

Locatable minerals

Affected environment

Locatable minerals, such as gold, silver, copper, and other metals, are subject to the General Mining Law of 1872, as amended. This law grants a statutory right to explore for and develop these minerals, unless the land has been formally withdrawn from mineral entry.

The FS manages impacts to other resources related to the exploration, development, and production of locatable minerals on its lands through regulations at 36 CFR 228, Subpart A.

FS authority is directed at using the surface of NF lands (30 U.S.C. 21-54). The FS may not deny proposed operations or make them impossible by imposing unreasonably restrictive management requirements or conditions. However, the FS may require mitigation and list requirements to minimize adverse impacts.

FS regulations say mining operations should minimize adverse environmental impacts to surface resources. The regulations include "taking all practicable measures" to maintain and protect wildlife habitat, and to reclaim surface disturbances including rehabilitating wildlife habitat.

FS regulations also require that roads be built and maintained to minimize or eliminate damage to other resources including wildlife. Unless otherwise authorized, roads that are no longer needed are to be closed, bridges and culverts removed, and the road surface shaped to a natural contour and stabilized.

Current situation
The planning area has a long history of locatable hard-rock minerals activity, mostly exploring and mining for lode gold, silver, copper, and other metals. Today, this usually takes place in historic mining areas, or where more recent interpretations of the geology lead to the discovery and production of economically valuable deposits.

Mining has waned since the late 1800s. Only a fraction of the historic sites operate today, and those that continue, do so with much more stringent environmental protection measures.

Most recent activity involves maintaining existing facilities; however, there are a few new exploration and production sites. Typically, motorized vehicles use established routes for access. New access requires project-specific analysis and approval.

The majority of surface disturbances are less than 20 acres. Presently there are five larger locatable operations ranging from 100 to 600 acres on NFS lands in lynx habitat in the planning area, all in Montana. Only two are operating. The other three are in the care-and-maintenance or reclamation phases.

Based on the minerals database maintained by FS Regions 1 and 4, which covers the last 15 years, about one-third of all Notices of Intent and Plans of Operation were for sites in lynx habitat. In fiscal year 2000, the FS processed 142 Plans of Operation and received 550 Notices of Intent. We anticipate this trend would continue in the future.

Future locatable mineral activity is likely to occur in areas of existing operations and where the geology is favorable for economically viable mines. Significant increases in the level of future exploration or development are not expected; the potential for future large mineral discoveries is considered low, but possible.

Effects

Alternative A, the no action alternative
Management direction concerning locatable minerals would not be changed under the no-action alternative, so there would be no effect to locatable mineral activities. Existing requirements for wildlife protection are provided in 36 CFR 228, Subpart A, which requires operators to comply with ESA. Impacts to and protection or mitigation measures for species are identified in site-specific project analysis before decisions are made about disturbance.

Alternatives B, C & D
Alternatives B, C, and D add management direction including Objective HU O5; Standards ALL S1 and HU S3; and Guidelines HU G4, HU G5, HU G7, and HU G9 (see Table 2-1 in Chapter 2). Objective HU O5 is concerned with managing activities such as exploring and developing minerals/oil and gas wells to reduce impacts to lynx and lynx habitat. Standard ALL S1 is concerned with maintaining habitat connectivity in new or expanded permanent developments. Standard HU S3 is concerned with limiting winter access to the use of designated routes for exploration and development.

Guideline HU G4 encourages the use of remote monitoring to reduce snow compaction. Guideline HU G5 encourages reclamation plans to restore lynx habitat. Guideline HU G7 encourages the building of new permanent roads away from ridge tops, saddles, areas important for lynx habitat connectivity, and forested stringers. Guideline HU G9 encourages the closure and reclamation of project roads. Basically this direction is about road building and use, and requires considering lynx habitat needs during

mineral exploration, development, and site reclamation.

Alternative E
In Alternative E, Objective HU O5; Standard ALL S1; and Guidelines HU G4, HU G5, HU G7, and HU G9 (see Table 2-1 in Chapter 2) remain the same as they are in Alternatives B, C, and D.

However, in Alternative E, Standard HU S3 is changed to Guideline HU G12. Like Standard HU S3, Guideline HU G12 is concerned with limiting winter access to the use of designated routes for exploration and development. But rather than *requiring* that exploration and development activities stay on designated routes, the guideline says they *should* be limited to designated routes. This adds some flexibility in conducting winter exploration and development activities while still meeting the objective of reducing impacts to lynx and lynx habitat.

Alternative F Scenario 1
The management direction in Alternative F Scenario 1 would apply to all lynx habitat in LAUs. Objective HU O5 is rephrased, but the meaning is the same as in Alternatives B, C, D, and E.

Standard ALL S1 is somewhat narrowed in its scope. In Alternative F the standard requires the maintenance of habitat connectivity *in those areas that are identified as Lynx Analysis Units or linkage areas*. This change focuses the standard on those areas that are important to lynx.

As in Alternative E, Alternative F has replaced Standard HU S3 with Guideline HU G12. Guideline HU G12 is concerned with limiting winter access to the use of designated routes for exploration and development. But rather than *requiring* that exploration and development activities stay on designated routes, the guideline says they *should* be limited to designated routes. This adds some flexibility in conducting winter exploration and development activities while still meeting the objective of reducing impacts to lynx and lynx habitat.

Guidelines HU G4, HU G5, HU G7, and HU G9 are the same as in the other action alternatives. Basically this direction is about road building and use, and requires considering lynx habitat needs during mineral exploration, development, and site reclamation.

Alternative F Scenario 2
Management direction would not have to be applied to Nez Perce, Salmon-Challis, Beaverhead-Deerlodge, Bitterroot, Ashley and Bighorn NFs, and the disjunct mountain ranges on the Custer, Gallatin, Helena and Lewis and Clark NFs until these areas are considered occupied. Existing requirements for wildlife protection area provided in 36 CFR 228, Subpart A, which require operators to comply with ESA. If any site-specific protection or mitigation is necessary those decisions would be made prior to disturbance. If lynx are discovered later, the management direction would apply. The direction does not preclude management, but requires consideration of lynx needs as described in the above and following section.

Alternatives B, C, D, E & F
None of the action alternatives preclude developing locatable minerals because the

FS does not have the authority to simply deny developing hard-rock mineral deposits. However, the alternatives do require lynx habitat needs be considered and lynx habitat connectivity to be provided. This could require additional mitigation and conditions to minimize effects on lynx, and could increase costs of development. The potential for additional mitigations and costs would depend on the site-specific situations for each claim that are unknown until such time as a plan-of-operations is filed and the site specific analysis is done. These include but are not limited to such variables as location, habitat type, existing infrastructure, potential size of the workings.

Leasable minerals

Affected environment

Leasable materials are federally owned fossil fuels (oil, gas, coal, oil shale, etc.), geothermal resources, sulfur, and phosphates that are subject to exploration and development under leases, permits, or licenses issued by the Secretary of the Interior, with FS input on NFS lands.

The 1920 Mineral Leasing Act, as amended, together with the 1987 Federal Onshore Oil and Gas Leasing Reform Act, provide the authority and management direction for federal leasable minerals on federal lands. In 1970, the Geothermal Steam Act added steam to the list of minerals that could be leased on NFS lands.

Regulations at 36 CFR 228.108 require oil and gas operators to comply with ESA during operations. They require roads and surface disturbances to be reshaped and revegetated when closed or abandoned. Mining operators also are obliged to post reclamation bonds to make sure reclamation takes place. Most existing plans include standards and guidelines for reclaiming mining operations.

The National Energy Policy was issued May 18, 2002. It says:

> *"Agencies shall expedite their review of permits or take other actions as necessary to accelerate the completion of such projects, while maintaining safety, public health and environmental protection."*

Acquired lands (hard-rock minerals)
Hard-rock minerals described as *locatable* on public-domain lands are described as *leasable* on lands acquired by the FS after 1891. On lands where the FS acquired mineral as well as surface rights, the BLM issues the prospecting permits and leases for hard-rock minerals, but BLM must first obtain the consent of the FS.

Oil, gas, coal, or geothermal
The BLM issues oil and gas, coal, and geothermal leases. The most common leases in this area are oil and gas leases which are issued for 10-year terms. Leasing decisions and development decisions are made in two stages:

- First, the FS makes a lease decision about which lands would be open for leasing, based on an analysis of the known impacts of exploration and development. This decision identifies which areas would be open to development subject to standard lease

terms, which areas would be open to development subject to constraints, called *lease stipulations*, and which would be closed to leasing. The FS informs the BLM of the results and the BLM is responsible for issuing the lease.

- Then, after a lease is issued, the lessee has legal rights to explore and develop, subject to the terms of the lease and other applicable state and federal laws. The lessee must obtain approval from the BLM and FS for post-lease activities. This is when site-specific resource protection measures are developed and are applied as conditions of approval for the surface-use plan of operations. Such measures must be within the scope of the rights granted under the terms of the lease.

Solid non-energy leasable materials
The BLM also issues 10-year-term leases for solid non-energy leasable materials, such as phosphate or sodium. The FS has no consent authority, but the BLM generally accepts FS recommendations.

Current situation

The oil and gas industry has been stable during the past decade, but is projected to grow. Currently in the planning area, about 820,000 acres are under lease for oil and gas, with more acres pending. Transmission pipelines are an integral part of the infrastructure associated with oil and gas production. Presently, there are no pipelines in lynx habitat.

During the last decade, only three wells have been drilled in lynx habitat in the planning area. Two, on the Custer NF and Helena NF (private in-holding) in Montana, were plugged and abandoned. The other, on the Bridger-Teton NF in Wyoming, is in production.

Eight forests in the planning area made lease-availability decisions for oil and gas. Recent estimates of foreseeable development suggest that 39 more wells may be drilled in the next decade in lynx habitat (see Table K-11 in Appendix K).

All leases say that before any disturbance may occur, surveys or studies may be needed to determine the extent of impacts on resources and whether mitigation would be required.

Leases also say that if threatened or endangered species are observed during operations, the lessee shall stop doing anything that would result in the destruction of the species.

There is one solid leasable mineral operation in the planning area on the Clearwater NF; however it is located outside lynx habitat. The Idaho Panhandle NF has received requests for garnet leases and would evaluate them during the next few years.

Effects

Alternative A, the no action alternative
Management direction concerning leasable minerals would not be changed under the no-action alternative, so there would be no effect to the management of leasable minerals. Existing requirements for wildlife protection are provided in 36 CFR 228.108(f), which requires operators to comply with ESA. Impacts to and protection or mitigation measures for species are identified in project analysis

before decisions are made about surface disturbing activities.

Alternatives B, C & D
Alternatives B, C, and D add management direction including Objective HU O5, Standards ALL S1 and HU S3, and Guidelines HU G4, HU G5, HU G7, and HU G9 (see Table 2-1 in Chapter 2). Objective HU O5 is concerned with managing activities such as exploring and developing minerals/oil and gas wells to reduce impacts to lynx and lynx habitat. Standard ALL S1 is concerned with maintaining habitat connectivity in new or expanded permanent developments. Standard HU S3 is concerned with limiting winter access to the use of designated routes for exploration and development.

Guideline HU G4 encourages the use of remote monitoring to reduce snow compaction. Guidelines HU G5 encourage reclamation plans to restore lynx habitat. Guideline HU G7 encourages the building of new permanent roads away from ridge tops, saddles, areas important for lynx habitat connectivity, and forested stringers. Guideline HU G9 encourages the closure and reclamation of project roads. Basically this direction is about road building and use, and requires considering lynx habitat needs during mineral exploration, development, and site reclamation.

Alternative E
In Alternative E, Objective HU O5; Standard ALL S1; and Guidelines HU G4, HU G5, HU G7, and HU G9 (see Table 2-1 in Chapter 2) remain the same as they are in Alternatives B, C, and D. However, in Alternative E, Standard HU S3 is changed to Guideline HU G12.

Like Standard HU S3, Guideline HU G12 is concerned with limiting winter access to the use of designated routes for exploration and development. But rather than *requiring* that exploration and development activities stay on designated routes, the guideline says they *should* be limited to designated routes. This adds some flexibility in conducting winter exploration and development activities while still meeting the objective of reducing impacts to lynx and lynx habitat.

Alternative F Scenario 1
Alternative F Scenario 1 would apply the management direction to all lynx habitat in LAUs. Objective HU O5 is rephrased, but the meaning is the same as in Alternatives B, C, D, and E.

Standard ALL S1 is somewhat narrowed in its scope. In Alternative F the standard requires the maintenance of habitat connectivity *in those areas that are identified as Lynx Analysis Units or linkage areas*. This change focuses the standard on those areas that are important to lynx.

As in Alternative E, Alternative F has replaced Standard HU S3 with Guideline HU G12. Guideline HU G12 is concerned with limiting winter access to the use of designated routes for exploration and development. But rather than *requiring* that exploration and development activities stay on designated routes, the guideline says they *should* be limited to designated routes. This adds some flexibility in conducting winter exploration and development activities

while still meeting the objective of reducing impacts to lynx and lynx habitat.

Guidelines HU G4, HU G5, HU G7, and HU G9 in Alternative F are the same as in the other action alternatives. Basically this direction is about road building and use, and requires considering lynx habitat needs during mineral exploration, development, and site reclamation.

Alternative F Scenario 2
Management direction would not have to be applied to Nez Perce, Salmon-Challis, Beaverhead-Deerlodge, Bitterroot, Ashley and Bighorn NFs, and the disjunct mountain ranges on the Custer, Gallatin, Helena and Lewis and Clark NFs until these areas are considered occupied. Only the Ashley, Beaverhead-Deerlodge and Custer NFs have new wells projected in the foreseeable future. Nine wells are projected to occur in the future in lynx habitat; three on the Ashley, four on the Beaverhead-Deerlodge and 2 on the Custer NF (see Appendix K, Table K-11). Management direction would not have to be applied to these nine wells.

If lynx are discovered later, the management direction would apply. The direction does not preclude management, but requires consideration of lynx needs as described in the above and following section.

Alternatives B, C, D, E & F
This proposal would add direction in the plan that would be considered as conditions of approval when permits were being processed. When lease proposals are received, the reviewing unit would see if the proposal is consistent with their leasing decisions, their existing plan, and the existing lease stipulations.

The action alternatives were reviewed to see if they would require more lease stipulations to be added to a permit. No cases were found where the management direction would require additional lease stipulations.

Once a mineral lease site is developed, the activity slows down. Monitoring a producing site usually involves little traffic. Some sites can be monitored remotely, using satellite technology. Oil production sites that use a pump jack or where oil is stored on-site would require regular, frequent visits.

Producing natural gas with a lift system, where the gas is directed into a flow line through a separator or dehydration unit, would not require frequent visits. Gas flow and line pressure could be monitored remotely, using solar powered equipment. Working with oil and gas operators during planning to encourage remote monitoring in the winter, may minimize snow compaction in some areas.

There is the potential that oil and gas well development would occur in lynx habitat. However, most drilling in the planning area is done at lower elevations outside lynx habitat. Implementing any of the action alternatives (Alternatives B, C, D, E, or F) would have little effect on oil and gas operations because, in large part, the standards and guidelines address requirements already included in regulations or existing management direction.

The ease of movement across frozen ground makes winter an attractive time for oil and gas exploration. Under any of the action alternatives, operators may experience some route restrictions if they want to access their site during winter for exploration, development, or maintenance. While the management direction may increase the cost of leaseable minerals operations in lynx habitat due to these restrictions, it would not prohibit access to federal minerals. The amount of cost increases would depend on the site-specific situations for each site that are unknown until such time as the surface use plan-of-operations is filed and the site specific resource protection measures are developed through NEPA. These may include but are not limited to such variables as location, habitat type, existing infrastructure, and potential size of the workings.

Adding management direction to existing plans would be consistent with the National Energy Policy because the direction should result in expediting permit review. The analysis shows that more stipulations are not needed to conserve lynx. The management direction can be applied as conditions of approval during the permit-to-drill stage (see Mineral & Energy Development in *Management direction considered*, in Chapter 2).

Lands with outstanding or reserved right

Affected environment

Private parties own some of the minerals on NFS lands. Most of the NFS lands in the northern Rockies were reserved from the public domain under the Forest Reserve Act of 1891. Since then, other lands have been acquired.

The titles to some of these lands are encumbered with *reservations*, that is, in some cases the previous owner *reserved* the mineral rights. In other cases, mineral rights were separated from the surface estate before the federal government acquired the surface. These mineral rights are *outstanding* to third parties. A very small percentage of lands in the planning area have reserved or outstanding rights.

These reserved and outstanding rights represent property interests in the land. Although the federal government owns and administers the surface, the mineral owner has certain rights as well. The most important of these is the right to access and develop the minerals. Other rights may be spelled out in individual deeds. The FS must consider these property interests during planning and implementation.

Effects

Alternative A, the no action alternative
Management direction concerning lands with outstanding or reserved rights would not be changed under the no-action alternative, so there would be no effect to

the managing of land with outstanding or reserved rights.

Alternatives B, C & D
Alternatives B, C, and D add management direction including Objective HU O5, Standards ALL S1 and HU S3, and Guidelines HU G4, HU G5, HU G7, and HU G9 (see Table 2-1 in Chapter 2). Objective HU O5 is concerned with managing activities such as exploring and developing minerals/oil and gas wells to reduce impacts to lynx and lynx habitat. Standard ALL S1 is concerned with maintaining habitat connectivity in new or expanded permanent developments. Standard HU S3 is concerned with limiting winter access to the use of designated routes for exploration and development.

Guideline HU G4 encourages the use of remote monitoring to reduce snow compaction. Guideline HU G5 encourages reclamation plans to restore lynx habitat. Guideline HU G7 encourages the building of new permanent roads away from ridge tops, saddles, areas important for lynx habitat connectivity, and forested stringers. Guideline HU G9 encourages the closure and reclamation of project roads. Basically this direction is about road building and use, and requires considering lynx habitat needs during mineral exploration, development, and site reclamation.

Alternative E
In Alternative E, Objective HU O5; Standard ALL S1; and Guidelines HU G4, HU G5, HU G7, and HU G9 (see Table 2-1 in Chapter 2) remain the same as they are in Alternatives B, C, and D. However, in Alternative E, Standard HU S3 is changed to Guideline HU G12.

Like Standard HU S3, Guideline HU G12 is concerned with limiting winter access to the use of designated routes for exploration and development. But rather than *requiring* that exploration and development activities stay on designated routes, the guideline says they *should* be limited to designated routes. This adds some flexibility in conducting winter exploration and development activities while still meeting the objective of reducing impacts to lynx and lynx habitat.

Alternative F Scenario 1
In Alternative F Scenario 1 management direction would be applied to all lynx habitat in LAUs. Objective HU O5 is rephrased, but the meaning is the same as in Alternatives B, C, D, and E.

Standard ALL S1 is somewhat narrowed in its scope. In Alternative F the standard requires the maintenance of habitat connectivity *in those areas that are identified as Lynx Analysis Units or linkage areas*. This change focuses the standard on those areas that are important to lynx.

As in Alternative E, Alternative F has replaced Standard HU S3 with Guideline HU G12. Guideline HU G12 is concerned with limiting winter access to the use of designated routes for exploration and development. But rather than *requiring* that exploration and development activities stay on designated routes, the guideline says they *should* be limited to designated routes. This adds some flexibility in conducting winter exploration and development activities

while still meeting the objective of reducing impacts to lynx and lynx habitat.

Guidelines HU G4, HU G5, HU G7, and HU G9 in Alternative F are the same as in the other action alternatives. Basically this direction is about road building and use, and requires considering lynx habitat needs during mineral exploration, development, and site reclamation.

Alternative F Scenario 2
Management direction would not have to be applied to Nez Perce, Salmon-Challis, Beaverhead-Deerlodge, Bitterroot, Ashley and Bighorn NFs, and the disjunct mountain ranges on the Custer, Gallatin, Helena and Lewis and Clark NFs until these areas are considered occupied. If lynx are discovered later, the management direction would apply. The direction does not preclude management, but requires consideration of lynx needs as described in the above and following section.

Alternatives B, C, D, E & F
The effect of the action alternatives (Alternatives B, C, D, E, and F) on reserved and outstanding mineral resources is directly related to the site-specific mitigation measures designed to protect habitat for lynx. They are developed during the NEPA analysis when a request to access reserved of outstanding minerals is made.

The FS is limited in its authority to deny developing outstanding and reserved rights. Resource protection measures must be reasonable and cannot foreclose exploration or development. The management direction is not expected to affect the reasonable enjoyment of reserved or outstanding rights.

Most exploration would not experience any restrictions, because drilling and trenching are generally not done during winter when snow compaction could present a problem. If new mine development is proposed inside lynx habitat, it is possible different road locations or more mitigation would be required. This could result in higher project costs, but would not delay or rule out prospecting, exploration, or development.

The potential for different road locations, additional mitigations, and higher costs would depend on the site-specific circumstances for each situation that are unknown until such time as a plan-of operations is filed and the site specific analysis is done. These include but are not limited to such variables as location, habitat type, existing infrastructure, and potential size of the workings.

Cumulative effects

Alternative A
The past, present, and reasonably foreseeable actions listed in Appendix L have cumulatively had a limited effect on the exploration for and development of mineral resources. Costs have likely increased due to the environmental protections required under INFISH and PACFISH. The Roadless Policy could result in changes to the areas available for some mineral and energy development. Alternative A would not add any additional standards or guidelines to the existing plans, and so, would not cumulatively add to existing impacts on

exploration for and development of mineral resources.

Alternatives B, C, D, E & F
Cumulatively the management direction, in addition to the past, present, and reasonably foreseeable future actions identified in the previous paragraph under Alternative A and in Appendix L, would add more environmental protections, potentially further increasing costs for mineral exploration and development. Several of the proposed requirements are already considered in project development, so the cost increases are unlikely to be substantial.

Management direction under any of the action alternatives would not cumulatively preclude the access to federal minerals or the access to private minerals beneath a federal surface.

Special use permits

Affected environment

Special uses are defined in 36 CFR 251.50(a) as:

> *All uses of NFS lands, improvements, and resources, except those provided for in the regulation governing the disposal of timber (Part 223) and minerals (Part 228) and the grazing of livestock (Part 222), are designated as "Special Uses."*

A special use authorization can be a permit, a term permit, a lease, or an easement. There are more than 100 different kinds of special uses that can be authorized on NFS lands. Criteria for screening proposals on NFS lands are found at 36 CFR 251 - Land Uses.

A large number of requests are received each year for road access in the planning area because private lands are often next to or inside NFS. Many tracts are small and zoned by counties to allow development.

Some private tracts are *inholdings*, privately owned lands surrounded by federal lands. Inholdings are guaranteed access under ANILCA (Alaska National Interests Lands Conservation Act of 1980), which says landowners shall be authorized access "adequate to secure them the reasonable use and enjoyment of their land" (36 CFR 251.110(c)).

Effects

Alternative A, the no action alternative
Currently each special use authorization contains terms and conditions to minimize damage to wildlife habitat and protect the environment (36 CFR 251.56 (a)(i)(B)). Impacts to and protection or mitigation measures for threatened and endangered species are identified in site-specific project analysis before any decisions are made about whether disturbances would be allowed.

Management direction in the plans would not be changed under the no-action alternative, so there would be no effect to the management of FS special uses.

Alternatives B, C & D
Alternatives B, C, and D would add management direction including Objectives HU O3 and HU O5 and Standards ALL S1 and HU S3 (see Table 2-1 in Chapter 2). Objective HU O3 concerns concentrating activities in existing developed areas rather than developing new areas in lynx habitat. Objective HU O5 concerns managing special uses; utility corridors; and mineral, oil, and gas exploration and development to reduce impact to lynx and their habitat. Standard ALL S1 concerns maintaining habitat connectivity for new or expanded permanent developments. Standard HU S3 concerns limiting winter access for non-

recreational special uses, and mineral and energy exploration and development to certain designated routes.

These action alternatives do not preclude special uses; however, they do require lynx habitat needs to be considered and connectivity provided. More conditions of approval and mitigation measures to reduce effects on lynx could be required and could increase the costs of development. The standards could limit the options for where access roads and authorized facilities would be located.

Alternatives E and F Scenario 1
Alternative E would add management direction including Objectives HU O3 and HU O5, and Standard ALL S1 the same as in Alternatives B, C, and D. However, instead of Standard HU S3, Alternative E would substitute Guideline HU G12 (see Table 2-1 in Chapter 2).

The management direction under Alternative F Scenario 1 would apply to all lynx habitat in LAUs. Alternative F would add management direction including Objectives HU O3 and HU O5, the same as in Alternatives B, C, D, and E. Standard ALL S1 is the same in Alternative F as the other alternatives except that Alternative F adds the phrase "…in an LAU and/or linkage area" to reiterate that the standard is applicable only in those areas. For Standard HU S3, Alternative F would substitute Guideline HU G12, the same as Alternative E (see Table 2-1 in Chapter 2).

The use of Guideline HU G12 allows for more flexibility in managing winter access for special uses. This flexibility is allowed in these alternatives because there is no indication that lynx are affected by this type of access (Appendix P).

These action alternatives do not preclude special uses; however, they do require lynx habitat needs to be considered and connectivity provided. More conditions of approval and mitigation measures to reduce effects on lynx could be required and could increase costs of development. The standard could limit the options for where authorized facilities would be located.

Alternative F Scenario 2
Management direction would not have to be applied to special use permit processing on Nez Perce, Salmon-Challis, Beaverhead-Deerlodge, Bitterroot, Ashley and Bighorn NFs, and the disjunct mountain ranges on the Custer, Gallatin, Helena and Lewis and Clark NFs until these areas are considered occupied. If lynx are discovered later, the management direction would apply. The direction does not preclude management, but requires consideration of lynx needs as described in the above section.

Cumulative Effects

Alternative A, the no action alternative
Since implementing the no action alternative would have no effects on the way FS special uses are managed, there would be no cumulative effects on the management of special uses from the no action alternative when combined with laws, regulations, and other plan direction.

Alternatives B, C, D, E, and F
Implementation of Objectives HU O3 and O5, Standard ALL S1, and either Standard HU S3 or Guideline HU G12, when combined with laws, regulations, and other plan direction, may cumulatively affect a special use's design, size, cost, timing, or location to a very small extent. Until such time as a particular special use is proposed it is not possible to estimate the cumulative impacts on a particular special use. Given appropriate planning, it is likely the cumulative effects would be negligible across the planning area.

Land ownership

Affected environment

The continuity of land ownership in the planning area varies inside National Forest unit boundaries, and includes parcels owned by private entities, states, tribes, and other federal agencies.

In the northern Rockies, NFS lands are generally fairly well connected, providing a good opportunity to maintain lynx habitat connectivity. The national forests in western Wyoming are adjacent to Yellowstone National Park, which is continuous public land not subject to development or exchange, adding to the ability to maintain lynx habitat connectivity. The planning area also includes scattered, isolated federal parcels that do not contribute to connectivity. Private lands not managed for lynx usually surround these isolated tracts.

For the FS land ownership changes come about through land exchanges, direct purchase, and conservation easements that enhance and protect wildlife habitat. The federal real estate program is active throughout the planning area. Its purpose is to manage and conserve the public's real property for the purposes for which it was reserved from the public domain. One of its primary goals is to consolidate land ownership patterns to help more effectively and efficiently manage federal lands.

The LCAS states, "... connectivity with habitats and source populations in Canada is critical to the conservation of populations in the U.S." (p. 2-18). When lynx was listed as a threatened species in the final rule in the *Federal Register*, the FWS discussed what were considered at that time to be natural and man-made barriers to lynx movement (Appendix O).

Fragmented land ownership and its resulting different land use patterns could fragment lynx habitat. There was concern raised that this fragmentation by land ownership in addition to roads, subdivisions, large water bodies, and other natural or human-caused breaks in the landscape would form a barrier to lynx migration.

"Since lynx was listed, the understanding of the vital role immigration of lynx from Canada plays in sustaining lynx in the contiguous United States has improved" (USDI FWS 2003, see Appendix P), as has our understanding of barriers. At the time the Remand Notice was published in the Federal Register in 2003 the FWS said, "It is essential that landscape connectivity between lynx habitats and populations in Canada and the contiguous United States be maintained... [However], at this time we know of no natural or human-caused barriers that effectively prohibit movement of lynx between Canada and the northern Rockies" (Appendix P).

Therefore, we know the northern Rockies needs to maintain landscape connectivity between lynx habitats, and as of now there is no information to conclude this connectivity has been blocked.

With this in mind, one linkage objective and one linkage guideline was developed that are concerned with land ownership patterns, Objective LINK O1 and Guideline LINK G1, the effects of which are discussed below.

Effects

Alternative A, the no action alternative
The real estate program would not change. Land ownership adjustments would continue, but may not be a priority because of limited funding. In some areas, lynx habitat may be exchanged, and in other areas it may be acquired. During the next decade, the federal government plans to acquire about 375,000 acres of land. There are no cumulative effects *per se* to landownership adjustments.

Alternative B, C, D, E, and F Scenario 1
All of the action alternatives (B, C, D, E, and F Scenario 1) would apply the management direction to all lynx habitat in LAUs. They all include Objective LINK O1 and Guideline LINK G1. Objective LINK O1 says that in areas of intermingled ownerships our objective is to work with landowners to pursue conservation easements, habitat conservation plans, land exchanges, or other solutions to reduce potential adverse impacts to lynx and lynx habitat. Guideline LINK G1 says that NFS lands should be retained in public ownership.

The land ownership objective and guideline would have no impact on the activities taking place on federal land. Nor would they have any impact on the ability of a private landowner to develop his or her private land if that individual chooses to do so. The effect of the objective and guideline would likely be an increased interest in consolidating management in lynx habitat, through land purchases, exchanges, or a variety of agreements with the various land owners.

Alternative F Scenario 2
The management direction, Objective LINK O1 and Guideline LINK G1, would not have to be applied to land ownership adjustments on Nez Perce, Salmon-Challis, Beaverhead-Deerlodge, Bitterroot, Ashley and Bighorn NFs, and the disjunct mountain ranges on the Custer, Gallatin, Helena and Lewis and Clark NFs until these areas are considered occupied. If lynx are discovered later, the management direction would apply. Lynx habitat would not have to be consolidated on these units. In some areas, some lynx habitat may be exchanged and in others it may be acquired.

Cumulative Effects

Cumulatively, an active real estate program could enhance and protect lynx habitat connectivity by retaining public lands and acquiring non-federal lands. During the next decade, about 375,000 acres could be acquired through land exchanges or purchases; some of this would be lynx habitat. With management direction it is possible a larger amount of land exchanges or purchases would be in

lynx habitat. The estimated number of acres may change, and the location of exchanged or purchased land is unknown at this time because both depend on landowners' willingness to exchange or sell their land. Additional lynx habitat could be enhanced and protected by acquiring conservation easements. But again, this is dependant on the willingness of landowners.

The continued federal ownership of scattered, isolated NFS lands that do not promote connectivity for lynx would be assessed on the site-specific level as it has in the past, but it is likely the management direction would not affect the outcome of such analyses.

Linkage habitat

Several people asked what the effect of the linkage direction would be on projects and developments. In response to those questions this section has been added to the FEIS.

Affected environment

Public land, whether isolated parcels or well connected areas that fall within linkage zones, but do not fall within lynx habitat in LAU are subject to the LINK Objective, Standards, and Guidelines. They are also subject to Objective ALL O1, Standard ALL S1, and Guideline ALL G1 (see Table 2-1). The vegetation (VEG) and human uses (HU) objectives, standards, and guidelines do not apply in linkage areas.

Objective LINK O1 and Guideline LINK G1 have been discussed above in the Land Ownership section. Standard LINK S1 concerns identifying potential highway wildlife crossings (discussed in the Transportation section). Standard LINK S2 and Guideline LINK G2 concern managing livestock grazing in shrub-steppe habitat (discussed in the Range section).

Standard ALL S1 concerns maintaining habitat connectivity for all new and expanded permanent developments and for all vegetation management projects in lynx habitat in LAUs and in linkage areas. Habitat connectivity is defined as an adequate amount of vegetative cover arranged in a way that allows lynx to move around (see glossary). Examples include narrow forested ridges, shrub-steppe plateaus, and wooded riparian areas. This standard is found in all action alternatives. Alternative F adds the phrase "…in an LAU and/or linkage area" to reiterate that the standard is applicable only in those areas.

Guideline ALL G1 concerns methods to reduce highway impact to lynx (discussed in the Transportation section).

Effects

Alternative A, the no action alternative
Under Alternative A there would be no new standards or guidelines for linkage areas to maintain lynx habitat connectivity. Therefore there would be no impacts from Alternative A on management of public land in lynx linkage areas, and no cumulative effects.

Alternatives B, C, D, E, and F Scenario 1
The effect of Standard ALL S1 would be the same in all action alternatives. These alternatives would apply the management direction to all lynx habitat in LAUs. New and expanded permanent developments and vegetation management projects would have to be designed to maintain lynx habitat connectivity. This may affect a development's or project's design, size, cost, or amount of return on the investment to a very small extent. Given appropriate planning, it is likely there

would only be minor effects on project or developments across the planning area. Until such time as a particular development or vegetation management project is proposed in a linkage area it is not possible to estimate the impact the management direction would have on a particular project or development.

Alternative F Scenario 2
The management direction would not have to be applied to linkage areas on Nez Perce, Salmon-Challis, Beaverhead-Deerlodge, Bitterroot, Ashley and Bighorn NFs, and the disjunct mountain ranges on the Custer, Gallatin, Helena and Lewis and Clark NFs until these areas are considered occupied. Units may still consider the management direction, but do not have to apply it. Little to no effect would be anticipated on these units.

Cumulative Effects

Cumulatively, in addition to the past, present, and reasonably foreseeable future actions listed in Appendix L, any of the action alternatives would add more management direction that would need to be taken into consideration when designing projects and developments in linkage areas. It is likely this would increase costs due to the constructing of structures that would provide for lynx movement, or could reduce a project's size in order to maintain lynx habitat connectivity.

However, it is likely most projects could be designed with lynx movement needs in mind, so few, if any, would not be allowed to be completed.

Economics & social

Social and economic analyses are conducted to determine what affect land management decisions may have on local communities, economies, and the people who use natural resources. This analysis considers the potential effects of the alternatives on employment, income, and other financial aspects, as well as on lifestyles and other factors.

Affected environment

Population

The 2000 U.S. Census showed a population increase in the four states in the planning area (US Census Bureau 2000). The populations of Utah and Idaho are both more than one million people. Table 3-61 shows the population for these states in the last two censuses, the change from 1990 to 2000, as well as projections for the year 2015 and 2025.

The 2000 census resulted in reported population densities of 15.6 people per square mile in Idaho, 6 in Montana, 27.2 in Utah, and 5.1 in Wyoming.

Populations are expected to continue to grow. By 2015, the population of Idaho is expected to increase 25 percent, Montana by 18 percent, Utah 20 percent, and Wyoming 30 percent.

Population changes are measured by counting natural increase - births minus deaths—and migration into and out of each state.

The states have fairly homogenous populations. Table 3-62 on the following page shows the racial composition by state.

A number of communities in the planning area depend heavily on natural resources from public lands, including:

Idaho
Ashton, Bonners Ferry, Clark Fork, Driggs, Dubois, Idaho Falls, Kamiah, Kooskia, Moyie Springs, Orofino, Pierce, Rexburg, Ririe, Salmon, St. Anthony, Sandpoint, Victor, and Weippe;

Montana
Alberton, Columbia Falls, Darby, Deer Lodge, Drummond, Eureka, Gardiner,

Table 3-61. Past and projected population of the analysis area

	1990 Population	2000 Population	2005 Population	2015 Population	2025 Population	Change 1990 to 2000 Number	Change 1990 to 2000 Percent
Idaho	1,006,749	1,293,953	1,480,000	1,622,000	1,739,000	287,204	28.5%
Montana	799,013	902,195	1,006,000	1,069,000	1,121,000	103,182	12.9%
Utah	1,722,850	2,233,169	2,411,000	2,670,000	2,883,000	510,319	29.6%
Wyoming	453,588	493,782	568,000	641,000	694,000	40,194	8.9%
U.S.	248,709,873	281,421,906	285,980,000	310,133,000	335,048,000	32,712,033	13.2%

Source: U.S. Bureau of the Census

Libby, Lincoln, Philipsburg, Red Lodge, Rexford, Seeley Lake, Superior, Thompson Falls, Troy, and West Yellowstone;

Utah
Kamas and Vernal; and

Wyoming
Buffalo, Evanston, Green River, Greybull, Jackson, Kemmerer, Lovell, Rock Springs, and Worland.

Demographic trends
Several demographic trends would impact the planning area in the next few decades. The first and most notable is that during the next 25 years, the West is expected to grow at nearly twice the national average rate.

The second trend, common to all states, is the aging of the population (Campbell 1996). The percent of people under 20 years of age would decrease, and the percent over 65 would increase during the next 30 years. After the year 2010, the elderly proportion would increase rapidly as the "baby boomers" born between 1946 and 1964 finally begin to reach retirement age. Utah, Idaho, and Wyoming are projected to be among the states with the most rapid growth in this segment, with national rankings anticipated to be second, third, and sixth respectively.

The third trend is the increasing level of participation in outdoor recreation, and the tendency for each succeeding generation during the last century to increase its level of participation (USDA 1997a). It is expected that the "baby boomers" would continue this trend, having been exposed to a broader range of outdoor activities then were their parents.

Economic

The four states in the planning area constitute a very large land area containing many "economies" as defined by Bureau of Economic Analysis classification system (USDC 1995). The information describing the economic environment is presented at the state level.

Employment
Figure 3-8 on the following page displays employment growth for full- and part-time workers (for both proprietors, and wage and salary) of major industries by state over the last 31 years (USDC 2002).

Table 3-62. Year 2000 population race by state

	Population	White	American Indian/ Alaska Native	Asian	Black/ African American	Other*
Idaho	1,293,953	91%	1%	1%	<1%	7%
Montana	902,195	90%	6%	<1%	<1%	2%
Utah	2,233,169	89%	1%	2%	1%	7%
Wyoming	493,782	92%	2%	<1%	1%	4%

*Native Hawaiian and other Pacific Islanders, some other race, or two or more races.
Source: U.S. Census Bureau. Census 2000

Idaho

In 1969 in Idaho, the largest major industry employer was government, with about 59,500 jobs statewide. By 1999, four industries accounted for more than half the employment – services, retail trade, government, and manufacturing. Services were the largest at about 199,260 jobs and mining the smallest, with only 3,261 jobs. In 1999, employment not including farming totaled about 761,000 jobs statewide.

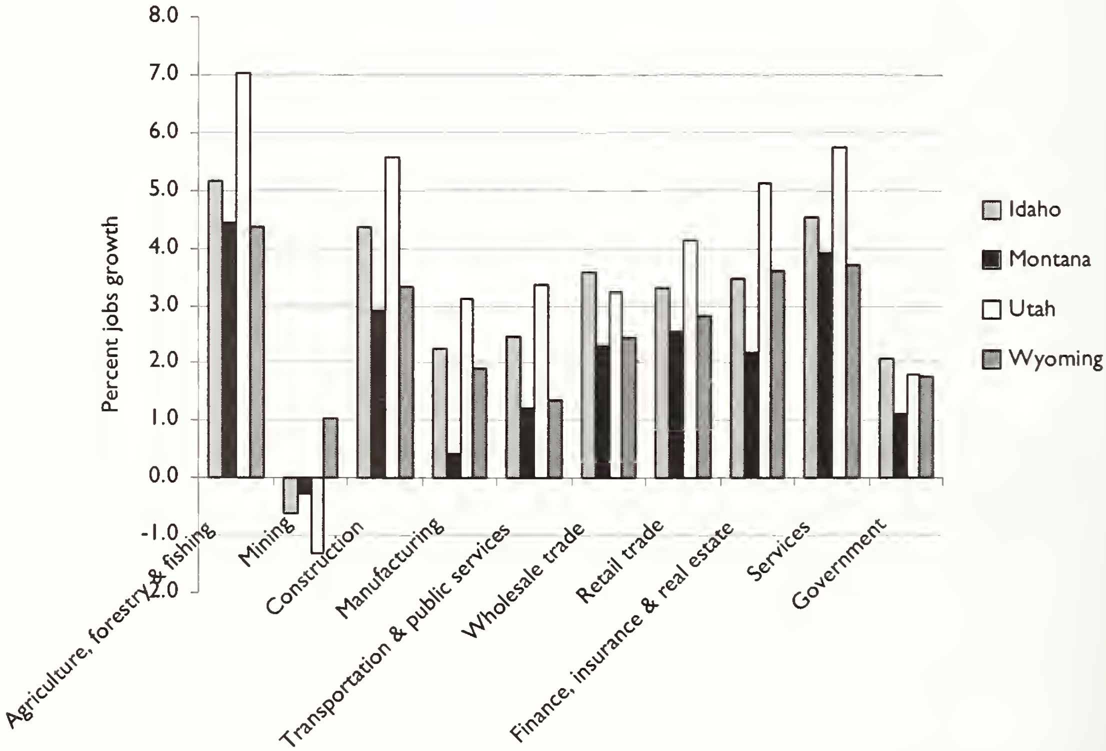
From 1969 to 1999, all sectors (except mining) experienced positive average annual employment growth, ranging from -0.6 percent for mining, to 5.2 percent for agriculture, forestry, and fishing.

Montana

In 1969 in Montana, the largest major industry employer was government, with about 60,000 jobs statewide. By 1999, three industries accounted for more than half the employment – services, retail trade, and government. Services were the largest at about 168,000 jobs and mining the smallest, with only about 6,500 jobs. In 1999, employment not including farming totaled about 520,000 jobs statewide.

From 1969 to 1999, all sectors (except mining) experienced positive average annual employment growth, ranging from -0.3 percent for mining, to 4.5 percent for agriculture, forestry, and fishing.

Figure 3-8. Average annual rate of job growth, 1969 to 1999



Utah

In 1969 in Utah, the largest major industry employer was government, with about 114,000 jobs statewide. By 1999, four industries accounted for more than half the employment - services, retail trade, government, and manufacturing. Services were the largest at about 406,200 jobs and mining the smallest, with only about 8,800 jobs. In 1999, employment not including farming totaled about 1,335,000 jobs statewide.

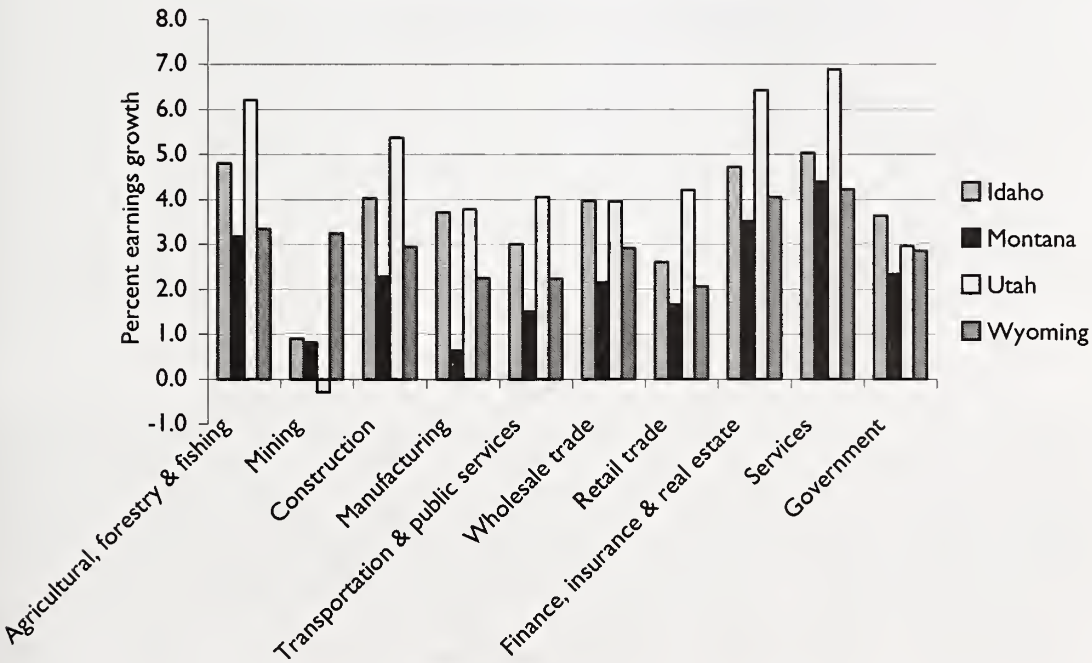
From 1969 to 1999, all sectors (except mining) experienced positive average annual employment growth, ranging from -1.3 percent for mining, to 7.0 percent for agriculture, forestry, and fishing.

Wyoming

In 1969 in Wyoming, the largest major industry employer was government, with about 36,700 jobs, and total private employment at about 143,600 jobs. By 1999, three industries accounted for more than half the employment - services, government, and retail trade. Services were the largest at about 82,300 jobs and agriculture, forestry, and fishing the smallest, with only about 4,700 jobs. In 1999, employment not including farming totaled about 309,400 jobs statewide.

From 1969 to 1999, all sectors experienced positive average annual employment growth, ranging from 1.0 percent for mining, to 4.4 percent for agriculture, forestry, and fishing.

Figure 3-9. Average annual rate of earnings growth, 1969 to 1999



Earnings

Figure 3-9 shows the average annual earnings growth between 1969 and 1999 by major industry by state (USDC 2002). All earnings data have been inflation-adjusted to year 2000 dollars. Earnings (wages and salaries, other labor income, and proprietors' income) are useful in analyzing regional economies, since they are a proxy for income generated from participation in current production.

Idaho

All the major industries in Idaho experienced positive earnings growth in real dollars from 1969 to 1999. The average annual earnings growth ranged from 5.0 percent for services, and 4.8 percent for agriculture, forestry, and fishing, to 0.9 percent for mining. Even though mining saw a decline in employment, the jobs remaining experienced some earnings growth in inflation-adjusted terms. Services grew the fastest and mining grew the slowest.

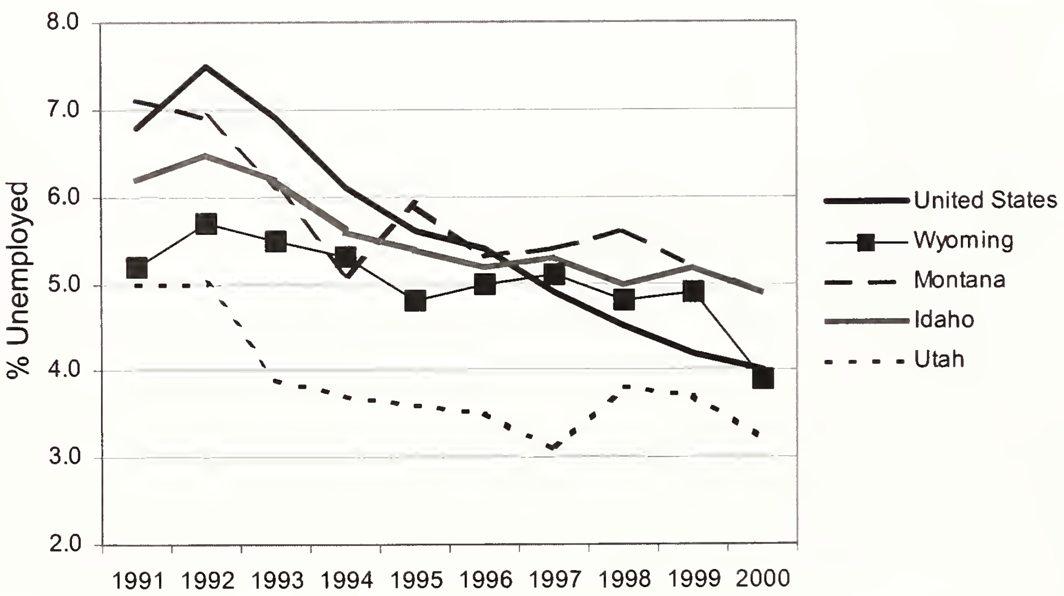
Montana

All the major industries in Montana experienced positive earnings growth in real dollars from 1969 to 1999. Again, though mining saw a decline in employment, the jobs remaining experienced some earnings growth in inflation-adjusted terms. Finance and services grew the fastest, while manufacturing and mining grew the slowest.

Utah

All the major industries in Utah experienced positive earnings growth in real dollars from 1969 to 1999, except for mining. The average annual earnings growth ranged from -0.3 percent for mining to 6.9 percent for services.

Figure 3-10. Unemployment rates



Wyoming
All the major industries in Wyoming experienced positive earnings growth in real dollars from 1969 to 1999. The average annual earnings growth ranged from 2.1 percent for retail trade to 4.2 percent for services.

Unemployment
Figure 3-10 on the previous page displays the unemployment rates for the states within the planning area compared to the country as a whole (USDL 2002). The unemployment rate is the percentage of the labor force that is not working, but is actively seeking work. The unemployment rate for each state quantifies the magnitude of joblessness. The U.S. rate is included as a point of reference to better understand how unemployment in the planning area compares to the situation at the national level.

In general, the trend for unemployment during the 1990s was one of decline. The chart shows unemployment rates for each state as a whole—state-level data can mask the variability found at the county level. In the planning area, counties with the highest unemployment rates tend to be rural.

Personal income
Personal income is generally seen as a key indicator of a region's economic vitality. It includes all sources of income – income from work (labor income), income from private investments (dividends, interest, and rent), and income from government transfer payments (Social Security, retirement, disability, Medicare, and Medicaid).

Table 3-63 shows the total personal income for 1999 and its average annual growth from 1969 to 1999 by state (USDC 2002). To further measure the economic vitality of an area, divide personal income by the population, yielding per-capita personal income. Per-capita personal income was inflation-adjusted to year 2000 dollars.

Table 3-63 also shows how the components of personal income have changed over the last thirty years:

- The earnings share has declined, indicating labor income has become a smaller component of personal income.
- The transfer payments share has increased, indicating payments from the government have increased substantially.

Table 3-63. Personal income by state, 1969 to 1999

	Personal Income (billions)	Average annual growth	Per capita increase		As a percentage of total personal income					
					Earnings		Transfer payments		Investment income	
	1999	1969-1999	1969-1999	1998-1999	1969	1999	1969	1999	1969	1999
Idaho	$29.2	3.9%	2.0%	2.9%	79.1%	68.0%	8.3%	12.8%	12.7%	19.2%
Montana	$19.8	2.7%	1.8%	1.8%	75.6%	60.7%	9.1%	15.6%	15.3%	23.8%
Utah	$50.5	4.7%	2.2%	3.0%	80.1%	72.3%	7.5%	10.2%	12.3%	17.5%
Wyoming	$12.9	3.5%	2.2%	4.3%	77.3%	61.9%	7.4%	12.0%	15.3%	26.1%

Idaho
In 1999, per capita personal income was $23,292, an increase of about 2.9 percent from the previous year. This averages 2.0 percent annual growth from 1969 to 1999 in inflation-adjusted dollars.
Montana
In 1999, per capita personal income was $22,400, an increase of about 1.8 percent from the previous year. This averages 1.8 percent annual growth from 1969 to 1999 in inflation-adjusted dollars. Dividends, interest, and rent also have increased.

Utah
In 1999, per capita personal income was $23,705, an increase of about 3.0 percent from the previous year. This averages 2.2 percent annual growth from 1969 to 1999 in inflation-adjusted dollars.

Wyoming
In 1999, per capita personal income was $26,849, an increase of about 4.3 percent from the previous year. This averages 2.2 percent annual growth from 1969 to 1999 in inflation-adjusted dollars.

Effects

Each alternative was evaluated to determine what affect it would have on employment and labor income in the four states in the planning area.

Economic effects

The largest effect to the planning area's economy comes from the proposed restrictions on precommercial thinning in Standard VEG S5, found in all the action alternatives.

Economic effects of precommercial thinning

During the last five years, contractors have performed about 80 percent of the precommercial thinning work conducted by the FS. There is no specific economic industry sector defined for precommercial thinning—instead, its economic activity is recorded as part of the agriculture, forestry, and fishing sector. Unfortunately, we cannot identify how much precommercial thinning contributes to this sector.

In 1999, the agriculture, forestry, and fishing sector amounted to the following percentage of total state employment in the planning area:

- Idaho, 2.4 percent
- Montana, 1.6 percent
- Utah, 0.8 percent
- Wyoming, 1.5 percent

Analysis procedures
Economic effects can be categorized as direct, indirect, and induced. Direct effects are changes associated with the initial effects of a program. Indirect and induced effects are ripple effects resulting from subsequent rounds of spending in the economy.

An input-output analysis was used to estimate the job and labor income effects stemming from precommercial thinning (see Project record, Analysis, Economics—FEIS, Reports). The analysis traced the links between economic sectors and calculates the economic effects resulting from a direct impact on the economy.

Input-output analysis requires identifying an economic impact area. Functional economic areas provided by the Bureau of Economic Analysis guided development of the 18 economic areas used in this analysis. More information can be found about impact areas in the economics report in the (see Project record, Analysis, Economics—FEIS, Reports).

The IMPLAN Pro analysis system and 1999 IMPLAN data were used to develop the input-output models for this analysis (IMPLAN Professional 1999). For each of the impact areas, estimates were made of the jobs and labor income stemming from the precommercial thinning operations defined in the alternatives.

Funding precommercial thinning
To develop precommercial thinning costs, first each Forest developed precommercial thinning plans for the next decade for each alternative. Next they provided their thinning costs per acre. Then the total thinning costs were calculated for each alternative.

Two scenarios were developed, one based on full funding and the other based on an average of past funding. The full-funding scenario assumes Congress would allocate enough money to do all the precommercial thinning planned.

The average-funding scenario assumes an amount based on past funding. Historically, the precommercial thinning program has not been fully funded, and funding has varied from year to year. From 1994 to 1998 (the five years before lynx became an issue), planning-area forests received funding to do an average of 34 percent of the precommercial thinning planned, about 20,000 acres a year. This is the basis for the average-funding scenario.

It could be assumed that funding for about 20,000 acres a year would continue. But experience has shown funding is allocated in direct proportion to what is requested, so it is more likely that a percent of what is requested would be funded. If precommercial thinning requests were severely curtailed by Standard VEG S5, there could be an even larger drop in the dollars allocated to do the work.

Table 3-64. Acres of precommercial thinning* by alternative after a decade of average funding

	Alternative A	Alternative B	Alternatives C & E	Alternative D	Alternative F
Idaho	76,410	23,360	23,370	50,420	37,512
Montana	100,910	33,000	33,510	77,120	39,220
Utah	3,180	410	410	700	551
Wyoming	13,030	5,180	5,180	10,180	5,602
TOTALS	193,530	61,950	62,470	138,420	82,885

*Acres shown are both in and out of lynx habitat – reductions are all taken inside lynx habitat

Table 3-65. Economic effects by alternative after a decade of average funding

	Alternative A		Alternative B		Alternatives C & E		Alternative D		Alternative F	
	Jobs*	Income M$ ‡	Jobs	Income M$	Jobs	Income M$	Jobs	Income M$	Jobs	Income M$
Idaho	800	10,235	240	3,118	240	3,119	430	5,750	390	5,234
Montana	860	7,916	290	2,631	290	2,674	560	5,090	340	3,102
Utah	10	129	1	17	1	17	2	28	2	22
Wyoming	110	1,229	40	508	40	508	90	997	50	555
TOTALS	1,830	20,179	611	6,822	611	6,866	1,132	12,413	832	9,461

* Except for single digits, the number of jobs by state is rounded to the nearest 10.
‡ Thousands of dollars

The effects are presented first for the average-funding scenario of about 20,000 acres per year, then for the full-funding scenario.

In both cases, Alternative A, the no action alternative, provides a baseline for comparison, because it shows the amount of precommercial thinning that could be done if no restrictions were applied to conserve lynx habitat.

Average funding

Table 3-64 on the previous page shows the acres that would be pre-commercially thinned during the next decade by alternative and state, assuming the average-funding scenario of about 20,000 acres per year.

Table 3-65 displays the employment and labor income effects of the alternatives over a decade by state, assuming average funding.

Table 3-66. Comparison of economic effects after a decade of average funding

	Number of jobs*				Labor income in thousands of dollars			
Alternative:	B vs A	C&E vs A	D vs A	F vs A	B vs A	C&E vs A	D vs A	F vs A
Idaho	-560	-560	-360	-400	-7,117	-7,115	-4,485	-5,001
Montana	-570	-570	-300	-520	-5,285	-5,242	-2,826	-4,814
Utah	-10	-10	-10	-10	-112	-112	-101	-107
Wyoming	-70	-70	-20	-60	-721	-721	-232	-674
TOTALS	-1,210	-1,210	-690	-990	-13,235	-13,191	-7,643	-10,595

*The number of jobs by state is rounded to the nearest 10.

Table 3-67. Precommercial thinning* by alternative after a decade of full funding

	Alternative A	Alternative B	Alternatives C & E	Alternative D	Alternative F
Idaho	226,980 acres	70,280 acres	70,320 acres	153,930 acres	114,230 acres
Montana	315,310 acres	103,070 acres	104,700 acres	240,970 acres	122,560 acres
Utah	8,580 acres	1,100 acres	1,100 acres	1,880 acres	1,490 acres
Wyoming	25,350 acres	8,630 acres	8,630 acres	20,590 acres	9,720 acres
TOTALS	576,220acres	183,080 acres	184,750 acres	417,370 acres	248,000 acres

*Acres shown are both in and out of lynx habitat—reductions are all taken inside lynx habitat

The economic effects shown here are total effects—direct, indirect, and induced. The economic effects consist of jobs and labor income tied directly to thinning, plus ripple effects from industries supporting thinning. Table 3-66 on the previous page compares the economic effects of the alternatives, assuming average funding for decade. It is important to note again that it is impossible to predict what the actual funding would be. The differences among the alternatives would not be as great if we could be sure that 20,000 acres of precommercial thinning per year would be funded.

Full funding

Table 3-67 shows the acres that would be precommercially thinned during the next decade by alternative and state, if Congress appropriated enough money to do all the thinning planned. This would be a substantial increase compared to the existing situation because the precommercial thinning program has never been fully funded.

Table 3-68 displays the employment and labor income effects of the alternatives over a decade by state, assuming full funding.

Again, the economic effects here are totals—direct, indirect, and induced—

Table 3-68. Economic effects by alternative after a decade of full funding

	Alternative A		Alternative B		Alternatives C & E		Alternative D		Alternative F	
	Jobs*	Income M$‡	Jobs	Income M$	Jobs	Income M$	Jobs	Income M$	Jobs	Income M$
Idaho	2,370	30,616	720	9,430	720	9,436	1,320	17,541	1,200	16,009
Montana	2,690	24,737	890	8,223	910	8,353	1,740	15,829	1,060	9,694
Utah	30	349	3	45	3	45	6	76	5	61
Wyoming	220	2,459	70	847	70	847	180	2,072	80	969
TOTALS	5,310	58,161	1,683	18,544	1,603	18,681	3,246	35,597	2,345	26,732

*Except for single digits, the number of jobs by state is round to the nearest 10.
‡Thousands of dollars

comprising of jobs and income tied directly to thinning, plus ripple effects from supporting industries. Table 3-69 compares economic effects after a decade of full funding.

Alternative A, the no action alternative

Table 3-64 shows that under the no-action alternative, if for the next decade the precommercial thinning program was funded at about 20,000 acres per year (the average-funding scenario), about 200,000 acres would be thinned. This represents about 180 jobs per year and about $2.0 million per year in labor income (Table 3-65).

Table 3-67 shows that under the no-action alternative, if for the next decade the precommercial thinning program was fully funded, about 576,000 acres would be thinned. This represents about 530 jobs per year and about $5.8 million per year in labor income (Table 3-68). This would be a considerable increase above the existing situation, because the precommercial thinning program has never been fully funded.

Under either funding scenario, most of the jobs and labor income effects would occur in Montana and Idaho, where most of the precommercial thinning is planned.

Alternatives B, C & E

These three alternatives have similar effects, so they are discussed together. Alternative B would defer precommercial thinning until stands no longer provide snowshoe hare habitat. Alternatives C and E are identical in terms of precommercial thinning—both would defer precommercial thinning until stands no longer provide snowshoe hare habitat, with some minor exceptions.

Table 3-64 shows that under Alternatives B, C, or E, if for the next decade the precommercial thinning program was funded at about 20,000 acres per year (the average-funding scenario), about 130,000 of the 200,000 acres planned would not be thinned because they are in lynx habitat. (The figure 130,000 is approximately the difference between Alternative A and Alternatives B, C, and E.) These alternatives each would represent about 60 jobs per year and about $680,000 per year in labor income under the average-

Table 3-69. Comparison of economic effects after a decade of full funding

	Number of jobs				Labor income in thousands of dollars			
	B vs A	C&E vs A	D vs A	F vs A	B vs A	C&E vs A	D vs A	F vs A
Idaho	-1,660	-1,660	-1,050	-1,170	-21,186	-21,180	-13,075	-14,607
Montana	-1,800	-1,780	-950	-1,640	-16,515	-16,384	-8,909	-15,043
Utah	-27	-27	-24	-20	-304	-304	-272	-288
Wyoming	-150	-150	-40	-140	-1,612	-1,612	-387	-1,490
TOTALS	-3,637	-3,617	-2064	-2,970	-39,617	-39,481	-22,564	-31,429

funding scenario (Table 3-65).

Compared to the no-action alternative under the average-funding scenario, Alternatives B, C, or E would represent a loss of about two-thirds of the jobs and labor income. The effect would be felt most in those rural communities named in the Affected Environment portion of this report, communities that tend to experience a higher unemployment rate. The communities most affected are in the seven NFs experiencing 80 percent of the reduction, the Idaho Panhandle, Salmon-Challis and Targhee NFs in Idaho; and the Beaverhead-Deerlodge, Flathead, Kootenai and Lolo NFs in Montana. (See Appendix K, Tables K-14 and K-17 for a breakdown by unit.)

Alternative D

Alternative D would defer precommercial thinning under certain circumstances and conditions.

Table 3-64 shows that under Alternative D, if for the next decade the precommercial thinning program was funded at about 20,000 acres a year (the average-funding scenario), about 55,000 of the 200,000 acres planned would not be thinned because they are in lynx habitat. (The figure 55,000 is approximately the difference between Alternative A and Alternative D). Alternative D would represent about 110 jobs per year and about $1.2 million in labor income per year under the average-funding scenario (Table 3-65).

Compared to the no-action alternative under the average-funding scenario, Alternative D would represent a loss of about one-third of the jobs and labor income. This would be only about half the reductions expected under Alternatives B, C, and E. The communities most affected would be the same as under Alternatives B, C, and E.

Alternative F Scenario 1

Alternative F Scenario 1 would apply the management direction to all lynx habitat in LAUs. Alternative F allows for more flexibility than Alternatives B, C, and E when it comes to precommercial thinning, particularly in the wildland-urban interface. However, fewer acres of precommercial thinning would be accomplished than in Alternatives A and D.

Table 3-64 shows that under Alternative F, if for the next decade the precommercial thinning program was funded at about 20,000 acres a year (the average-funding scenario), about 110,000 of the 200,000 acres planned would not be thinned because they are in lynx habitat. (The figure 110,000 is approximately the difference between Alternative A and Alternative F). Alternative F would represent about 80 jobs per year and about $940,000 in labor income per year under the average-funding scenario (Table 3-65).

Compared to the no-action alternative under the average-funding scenario, Alternative F would represent a loss of about 55 percent of the jobs and labor income. This would be less than the reductions expected under Alternatives B, C, and E, but more than the reduction expected under Alternative D. The communities most affected would be the

same as under Alternatives B, C, D, and E.

Alternative F Scenario 2
Management direction would not have to be applied to Nez Perce, Salmon-Challis, Beaverhead-Deerlodge, Bitterroot, Ashley and Bighorn NFs, and the disjunct mountain ranges on the Custer, Gallatin, Helena, and Lewis and Clark NFs until these areas are considered occupied. Units may still consider the management direction, but do not have to apply it. Additional precommercial thinning could occur on these units; therefore there could potentially be no economic effect to these units. However it is likely units may consider the management direction; therefore the economic effects on the unoccupied areas would be somewhere in between Alternatives A and F. Appendix K, Tables K-14 through K-17 provides the economic breakdown by unit.

Economic effects of snowmobling

Table 3-70 shows the trend in the number of registered snowmobiles in planning area states. This information is useful in gauging the popularity of snowmobiling, an outdoor activity for which precise estimates of use over time are difficult to obtain. The data indicates an upward trend in all states.

Idaho
The Department of Resource Recreation and Tourism at the University of Idaho conducted a study of winter sports in Idaho during the winter season of 1994-1995 (Parrish, Leidner, Hunt & Sanyal 1994). This study was not designed to collect economic information, so estimates of economic effects are not available for snowmobiling in Idaho.

Montana
The Bureau of Business and Economic Research (BBER) at the University of Montana studied the economic contributions of snowmobiling in Montana in 1988, 1994, and 1998. According to the 1998 BBER report, during the winter 1997-1998, between 9 and 14 percent of Montana residents participated in snowmobiling. This amounts to 1.1 million activity days for Montana resident snowmobilers. BBER estimated more than 222,000 non-resident activity days.

The Montana resident and non-resident

Table 3-70. Growth in number of snowmobiles registered by state

	Registered snowmobiles*		Average growth	
	1989 – 1991	2000 – 2001	Registered snowmobiles	State population
Idaho	21,500 in 1991	38,200 in 2001	2.3%	2.5%
Montana	15,100 in 1991	24,600 in 2001	5.0%	1.2%
Utah	12,800 in 1990	29,400 in 2001	7.9%	2.6%
Wyoming	15,300 in 1989	18,200 in 2000	1.6%	0.8%

Data from Idaho Department of Parks & Recreation; Montana Department of Fish, Wildlife & Parks; Utah State Parks & Recreation Department; and Wyoming State Parks & Trails Department
*Numbers rounded to the nearest 100

Table 3-71. Spending in Montana by resident and non-resident snowmobilers in 1997-1998

	Per person per day			
Item	Resident		Non-resident	
Gas for snowmobiles	$10.15	18.6%	$12.76	6.4%
Gas for transportation	$10.55	19.4%	$14.39	7.3%
Lodging	$8.55	15.7%	$70.28	35.5%
Eating & drinking	$10.87	19.9%	$49.02	24.7%
Grocery & convenience stores	$5.63	10.3%	$9.48	4.8%
Entertainment & recreation places	$1.06	1.9%	$9.51	4.8%
Snowmobile dealers	$6.13	11.3%	$18.02	9.1%
Other retail	$1.46	2.7%	$12.11	6.1%
Other	$0.11	0.2%	$2.51	1.3%
DAILY TOTALS	$54.51	100%	$198.08	100%

days combined amounted to 1.3 million snowmobile activity days, greater than the total at downhill ski areas, which amounted to about 1 million activity days.

Table 3-71 shows the spending profiles for snowmobilers in Montana during the winter of 1997-1998. Resident snowmobilers spent about $54 per person per activity day and non-residents spent about $200.

Resident snowmobilers spent about $60 million during the same period for daily personal expenses. Residents spent the most on gasoline, amounting to $22.8 million or 38 percent of the total amount spent. Residents spent the next most on eating and drinking, amounting to just under $12 million or about 20 percent of the total amount spent.

Non-resident snowmobilers spent more than $44 million during the winter of 1997-1998 for daily personal expenses in Montana. About $16 million, or 36 percent, was spent on lodging, and $11 million, or 25 percent of the total amount, in restaurants and drinking establishments.

Utah

The Institute of Outdoor Recreation and Tourism at Utah State University studied the economic impact of resident snowmobilers in Utah during the winter of 1999-2000 (McCoy, Fujisaki, Blahna & Keith 2001). Table 3-72 on the next page shows residents spent about $19.7 million on trip-related expenses, with an average of about $127 per trip.

Most money was spent repairing or maintaining snowmobiles. The second and third largest amounts were spent on gasoline for the snowmobiles and towing vehicles. Since only residents were surveyed, spending on food and lodging was relatively low.

Direct employment and labor income derived from the $19.7 million was estimated to be 171 jobs and $3.3 million in labor income in Utah. The total economic effect—direct plus indirect—

Table 3-72. Spending in Utah by resident snowmobilers in 1999-2000

Item	Per trip	
Gas for snowmobiles	$31.03	24.5%
Gas for transportation	$22.40	17.6%
Lodging	$6.39	5.0%
Eating & drinking	$8.50	6.7%
Grocery & convenience stores	$13.28	10.5%
Parking area fees	$1.07	0.8%
Other recreation activities	$0.79	0.6%
Snowmobile rental, tour packages, or guide services	$0.75	0.6%
Repair or maintenance of snowmobiles	$36.86	29.1%
Retail items	$5.67	4.5%
Other	$0.13	0.1%
TOTAL PER TRIP	$126.87	100%

was estimated at 259 jobs, representing $5.5 million in labor income.

Wyoming

The Department of Agricultural and Applied Economics at the University of Wyoming published a report in October 2001 reporting findings of an economic assessment of snowmobiling in Wyoming (McManus, Coupal & Taylor 2001). The study included residents, non-residents and the clients of outfitters. Economic impacts were developed only for non-residents, and outfitter clients, since they bring new dollars into the state's economy.

Residents spent $69 per person per day. Total resident spending was about $94.4 million, which accounted for $4.5 million in state and local government revenue.

Non-residents spent $98.99 per person per day in Wyoming (Table 3-73). Total

Table 3-73. Spending in Wyoming by non-resident snowmobilers in 2000-2001

	Per person per day	
Lodging	$35.17	35.5%
Eating & drinking	$21.90	22.2%
Grocery/liquor	$6.17	6.2%
Gasoline	$17.73	17.9%
Oil/repair	$3.28	3.3%
Retail	$6.02	6.1%
Snowmobile rental	$3.06	3.1%
Guided tours	$2.80	2.8%
Other recreation	$0.94	1.0%
Other purchases	$1.92	1.9%
TOTALS	$98.99	100%

non-resident spending was about $97.6 million. The economic impact of non-resident spending was estimated to be 2,482 jobs, representing $34.4 million in labor income.

Outfitter clients spent $180.27 per person per day, or about $40.8 million (Table 3-74). The economic impact from outfitter clients alone amounted to 1,335 jobs and $15.9 million in labor income.

Alternative A, the no action alternative
Based on past growth, an increasing trend in snowmobile use is likely (Table 3-70). Since Alternative A would impose no change to winter recreation opportunities, it would have no effect on the economic contributions of snowmobiles.

Alternative B, the Proposed Action
Alternative B would allow no net increase in designated over-the-snow routes. Grooming could expand on routes currently designated. New or expanded special use authorizations or agreements would be limited to existing designated routes and areas. Some outfitters could be affected on a local basis.

However, there would be no restrictions preventing the public from expanding use any place identified on a travel plan map as open to motorized use. Therefore, there would be no effect on the economy.

Alternative B would not change the contributions of snowmobiling to the economy, and the current level of use is likely to continue.

Alternatives C, D, E & F Scenario 1
Alternatives C, D, E, and F would apply the management direction to all lynx habitat in LAUs. These alternatives would allow no net increase in designated over-the-snow routes, except where existing use already is concentrated. Under Alternatives C and D this is a Standard. Under Alternatives E and F this is a guideline, allowing for some flexibility. Grooming could expand on routes currently designated.

Table 3-74. Spending in Wyoming by snowmobile outfitter clients in 2000-2001

	Per person per day	
Lodging	$32.58	18.1%
Eating & drinking	$19.91	11.0%
Grocery/liquor	$3.73	2.1%
Gasoline	$6.78	3.8%
Oil/repair	$1.19	0.7%
Retail items	$13.78	7.7%
Snowmobile rental	$18.24	10.1%
Snowmobile tours	$20.93	11.6%
Guided tours	$52.12	28.8%
Other recreation	$6.89	3.8%
Other purchases	$4.11	2.3%
TOTALS	$180.27	100%

Alternatives C, D, E, and F would allow some expansion, so they are unlikely to result in localized effects on outfitters.

Like Alternative B, Alternatives C, D, E, and F would have no restrictions preventing the public from expanding use, so there would be no effect on the economy.

Alternatives C, D, E, and F would not change the current economic contributions of snowmobiling and is unlikely to change growth trends, since some expansion of routes is anticipated.

Alternative F Scenario 2
Management direction would not have to be applied to Nez Perce, Salmon-Challis, Beaverhead-Deerlodge, Bitterroot, Ashley and Bighorn National Forests, and the disjunct mountain ranges on the Custer, Gallatin, Helena, and Lewis and Clark NFs until these areas are considered occupied. Units may still consider the management direction, but do not have to apply it. Alternative F, Scenario 2 would not change the current economic contribution of snowmobiling and would not change growth trends on unoccupied forests. As noted above in the discussion of Alternatives B, C, D, E and F Scenario 1, even if these forests consider the management direction the effects to snowmobiling are likely to be minimal.

Economic effects of downhill and cross-country skiing

Information about the economic contribution of ski areas and cross-country skiing could not be established in the planning area, so an economic analysis was not done. NEPA says that when information is incomplete and unavailable, "… the agency shall always make clear that such information is lacking" (40 CFR 1502.22). The available information on skiing was presented in the *Recreation* section.

Nevertheless, all the action alternatives would have negligible effects on downhill and cross-country skiing. The action alternatives could increase some costs associated with developing or expanding ski areas, but would not result in preventing new or expanding existing areas. It is unlikely the increased costs would have a substantial, adverse effect on ski area development or expansion.

Economic effects from other standards & guidelines

Alternative A, the no action alternative
Under the no-action alternative all sectors of the economy except mining would likely continue their present positive average annual employment and income growth rates.

Alternative A would have no effect on or change the economic contributions of outfitters, livestock grazing, or mineral resource management. Therefore, it would not have an economic effect on these industries.

Alternatives B, C, D, E & F Scenario 1
Alternatives B, C, D, E, and F Scenario 1 would apply the management direction to all lynx habitat in LAUs. These alternatives would have a negligible economic effect on grazing, ski areas,

and mining. The standards do not rule out developing new or managing existing grazing allotments, ski areas, or mineral resources. However, managing to provide for lynx habitat needs could result in increased costs. For example:

- Grazing allotment costs may increase because Standard GRAZ S3 (in Alternatives B, C, and D) and Guideline GRAZ G3 (in Alternatives E and F) call for what may be new management direction in some allotments east of the Continental Divide for managing livestock in riparian areas. In a very few cases, structural improvements, such as fences, may be required to make sure livestock would be managed appropriately to maintain woody plants (see Range discussion);
- Costs for new or expanding ski areas may increase under Alternative B's Standard HU S2 and under Alternatives C, D, E, and F's Guideline HU G10. The standard requires (and the guideline recommends) that when new trails, access roads, and lift termini are planned, they be located to provide for lynx diurnal security habitat; and
- Costs for oil and gas leasing may increase because Guideline HU G4 (Alternatives B, C, D, E, and F) recommends monitoring wells remotely. However, remote monitoring may be cheaper in the long term.

Alternative F Scenario 2
Management direction would not have to be applied to Nez Perce, Salmon-Challis, Beaverhead-Deerlodge, Bitterroot, Ashley and Bighorn NFs, and the disjunct mountain ranges on the Custer, Gallatin, Helena, and Lewis and Clark NFs until these areas are considered occupied. Units may still consider the management direction, but do not have to apply it. Alternative F, Scenario 2 would have negligible economic effects. If units do consider the management direction then some activities may see increased costs; otherwise there would be no additional costs incurred until an area becomes occupied. Once occupied the effects would be the same as described in Alternative F, Scenario 1.

Social effects

Social impacts are described in terms of social well-being. Factors that can affect social well-being include the availability, amount, and quality of resources such as recreation and economic opportunities.

Public concerns expressed in response to the proposed action ranged from strong opposition to strong support. Some people were concerned that the proposal would reduce motorized recreation opportunities and be unfair to the elderly, disabled, and families with young children. Others were concerned it might close off family-oriented recreation opportunities such as cross country skiing and snowmobiling, or result in losing access to public lands.

Social effects of precommercial thinning

Alternative A, the no action alternative
Alternative A would not change the current social environment or employment opportunities, so there would be no social effects.

Alternatives B, C, D, E & F Scenario 1
Alternatives B, C, D E and F Scenario 1 would apply the management direction to lynx habitat in LAUs. These alternatives would result in fewer employment opportunities in communities associated with the Idaho Panhandle, Salmon-Challis, and Targhee NFs in Idaho; and the Beaverhead-Deerlodge, Flathead, Kootenai and Lolo NFs in Montana (see Economics discussion).

Compared to the no action alternative, Alternatives B, C, and E would result in a reduction of about two-thirds of the jobs stemming from precommercial thinning under the average-funding scenario, and Alternative D would result in about a one-third reduction. Alternative F would fall between one-third and two thirds. Based on past experience, approximately 34 percent of the needed precommercial thinning (no action) is actually funded. The historic average is close to 20,000 acres per year. Therefore, the management direction, regardless of which alternative is selected, would not substantially change the acres actually thinned or the employment opportunities from precommercial thinning.

Alternative F Scenario 2
Management direction would not have to be applied to Nez Perce, Salmon-Challis, Beaverhead-Deerlodge, Bitterroot, Ashley and Bighorn NFs, and the disjunct mountain ranges on the Custer, Gallatin, Helena, and Lewis and Clark NFs until these areas are considered occupied. Units may still consider the management direction, but do not have to apply it. The social effects on the unoccupied units would likely be somewhere between no change, Alternative A, and the changes described for the other alternatives. The effects would likely be less than the other action alternatives on the Beaverhead-Deerlodge and Salmon-Challis NFs since these units are currently unoccupied.

Social effects of snowmobiling

Alternative A, the no action alternative
Alternative A would not change the current social environment or employment opportunities or what routes were available for over-the-snow activities or their potential to expand, so there would be no social effects from Alternative A.

Alternative B, the Proposed Action
Under Alternative B, use levels may increase on existing groomed routes, so user experience likely would change. For those users who enjoy seeing and meeting more users on routes this would be a more positive experience. For those users who desire a more solitary experience, the change would lessen the quality of their recreational experience to a small extent.

General use in places identified on travel plan maps as open for motorized use would not be affected by the alternative. But in some places, most probably the NFs immediately adjacent to Yellowstone National Park, it could affect future levels of general use, due to increased use on existing designated trails, and therefore change user experience. The average growth in snowmobile use could level out.

For more discussion on effects of Alternative B on the snowmobiling public see the recreation section.

Alternatives C, D, E & F Scenario 1
Under Alternatives C, D, E, and F, groomed routes could increase, so there should be no change in user experience. General use in places identified on travel plan maps as open for motorized use would not be affected, so there should be no change in user experience.

For more discussion on effects of Alternatives C, D, E, and F on the snowmobiling public see the recreation section.

Alternative F Scenario 2
Management direction would not have to be applied to Nez Perce, Salmon-Challis, Beaverhead-Deerlodge, Bitterroot, Ashley and Bighorn NFs, and the disjunct mountain ranges on the Custer, Gallatin, Helena, and Lewis and Clark NFs until these areas are considered occupied. Units may still consider the management direction, but do not have to apply it. The social effects regarding winter recreation on the unoccupied units would likely be somewhere between no change, Alternative A, and the changes described for the other alternatives.

Social effects from other standards & guidelines

Alternatives B, C, D, E, and F Scenarios 1 or 2 would have a negligible social effect on grazing, ski areas, and mining. The standards do not rule out developing new or managing existing grazing allotments, ski areas, or mineral resources. However, managing to provide for lynx habitat needs could result in increased costs. For example, the cost of a ski pass could increase and the amount of area available for ski area expansion or development could reduce. Depending on the price a skier is willing to pay and what type of experience he or she expects, any of the action alternatives could minimally affect skier satisfaction in the long-term.

Cumulative effects

The cumulative effects analysis focused on the additive changes of past, present, and reasonably foreseeable future programmatic actions. Appendix L identifies these actions and describes how they could contribute cumulatively to social and economic consequences.

Alternative A
Past, present, and reasonably foreseeable programmatic decisions have been affecting local economies and social well-being, especially small rural communities with economies that depend heavily on natural resources from public lands. Communities in the

Idaho Panhandle, Salmon-Challis and Targhee NFs in Idaho; and the Beaverhead-Deerlodge, Flathead, Kootenai and Lolo NFs in Montana, have been most affected.

Alternative A would not add any additional new objectives, standards, or guidelines that would cumulatively add to the existing past, present, or reasonably foreseeable programmatic decisions. There would be no cumulative effect from Alternative A.

Alternatives B, C, D, E & F
The past, present, and reasonably foreseeable programmatic decisions, in addition to the lynx proposal, may cumulatively affect local economies, especially small, rural communities with economies that depend heavily on natural resources from public lands.

Those communities are the places most likely to experience social and economic cumulative effects, such as continued job loss, less labor income, and social well-being, resulting from the reductions in precommercial thinning in Alternatives B, C, and E. There would be less effect from Alternative D because there is less reduction in the precommercial thinning program. Alternative F would fall somewhere in between.

Civil rights and environmental justice

The agencies have considered input from all persons and groups, regardless of age, race, income status, or other social and economic characteristics. No civil rights effects associated with age, race, creed, color, national origin or gender have been identified.

During the course of this analysis, potential impacts to minority populations were considered. Tribes with aboriginal territories in the analysis area were identified and contacted both formally and informally, and were given the opportunity to review and comment on the DEIS. We did not receive any comments that identified any minority populations that could be unequally affected.

Based on the analysis presented in the FEIS, none of the alternatives considered would result in any identifiable effects or issues specific to any known minority or low-income population or community.

Other required disclosures

The alternatives are programmatic in nature, consisting of direction that would be applied to future management activities. They do not prescribe site-specific activities on the ground. Standards in the alternatives do not allow more actions that could affect the environment than existing plans do.

American Indian Religious Freedom Act and tribal treaty rights
No effects on American Indian social, economic, or subsistence rights are anticipated. We received one comment from a Tribal Government. It did not identify any concerns about compliance with the American Indian Religious Freedom Act or impacts to tribal treaty rights from any of the alternatives.

Prime farmland, rangeland, or forestland
None of the alternatives would adversely affect prime farmland or rangeland. NFS lands are not considered prime forestland.

Effects on floodplains or wetlands
None of the alternatives would adversely affect floodplains or wetlands. Existing management direction for these resources would be maintained.

Effects on heritage resources
Heritage resources include areas, sites, buildings, art, architecture, memorials, and objects that have scientific, historic, or cultural value. They link people to their cultural history, provide insight into how people lived in the past, and reveal past and ongoing relationships between people and the natural world.

The National Historic Preservation Act (NHPA) and its implementing regulations require that federal agencies consider the effects of their undertakings on historic properties. The term *historic properties* refers to cultural properties that have been determined eligible for the National Register of Historic Places (NRHP).

Federal agencies must also consider American Indian traditional use, belief system, religious practices, and lifeway values as directed by the Archeological Resource Protection Act of 1979, NHPA, the Native American Graves Protection and Repatriation Act, and the American Indian Religious Freedom Act (AIRFA). Traditional American Indian cultural properties and natural features are potentially eligible for listing on the National Register. Contemporary use sites for traditional or cultural purposes are provided protection under AIRFA.

The alternatives do not propose management direction that affects heritage resources. When site-specific projects are proposed, a cultural inventory of would be conducted to prevent damage, mitigate unforeseen damage, or prevent impacts to sites in compliance with applicable requirements.

Effects on water quality

Section 303(d) of the Clean Water Act requires states to evaluate water quality in light of state water quality standards, report those stream segments that are impaired, and require determination of the total maximum daily load of pollutants allowed. The states in the planning area have identified impaired stream segments on NFS lands, and they are working with the agencies to determine how to reduce pollutants impacts and meet total maximum daily load requirements.

The alternatives encourage the use of fire to restore ecosystems; however, they do not change management allocations to allow fires to burn in new areas. The alternatives could result in fewer ground disturbing activities such as less precommercial thinning, and could result in additional protection of riparian areas from grazing. Therefore, the alternatives would not directly or indirectly result in further degradation of 303(d) listed waters.

Effects on special areas

Special areas include Wilderness areas, proposed wilderness, and Wild and Scenic and River Corridors. These areas are generally to be managed to maintain their existing character. The alternatives do not change the overall management direction of these areas.

Effects on other resources

Several other resources are not affected by the programmatic management direction. These include but are not limited to caves, soils, and scenery.

NFMA "significance" finding

The purpose of this proposal is to incorporate management direction into plans for the conservation and recovery of Canada lynx.

The National Forest Management Act (NFMA) provides that forest plans may be amended in any manner, but if the management direction results in a significant change in the plan, additional procedures must be followed.

In December 2004, the Forest Service removed the November 9, 2000 National Forest System Land and Resource Management Planning Regulations at 36 CFR 219, subpart A and replaced them with newly adopted regulations. The new regulations set forth a process for land management planning, including the process for developing, amending, and revising land management plans (36 CFR 219.1). These regulations also incorporate effective dates and transition periods. Section 219.4(e) says "Plan development, plan amendments or plan revision initiated before the transition period may continue to use the provisions of the planning regulations in effect before November 9, 2000" - in this case the 1982 regulations.

This proposal was initiated before the transition period (starting January 5, 2005), therefore it is being completed under the requirements of the 1982 regulations.

The 1982 regulations at 219.10(f) require the agency to determine whether or not a proposed amendment would result in a significant change in the plan. If the change resulting from the proposed amendment is determined to be significant, the same procedure as that required for development and approval of a plan shall be followed. If the change resulting from the amendment is determined not to be significant for the purposes of the planning process, then agency may implement the amendment following appropriate public notification and satisfactory completion of NEPA procedures.

Forest Service Manual (FSM) 1920, section 1926.5 identifies factors to consider in determining whether an amendment is significant or non-significant for those plans using planning regulations in effect before November 9, 2000.

Changes to the land management plan that are not significant can result from:

1. Actions that do not significantly alter the multiple-use goals and objectives for long-term land and resource management.
2. Adjustments of management area boundaries or management prescriptions resulting from further on-site analysis.
3. Minor changes in standards and guidelines.
4. Opportunities for additional projects or activities.

Examples of significant changes include:

1. Changes that would significantly alter the long-term relationship between levels of multiple-use goods and services originally projected.
2. Changes that may have an important effect on the entire land management plan or affect land and resources throughout a large portion of the planning area during the planning period.

Alternative F is the FEIS preferred alternative therefore this alternative will be evaluated based on the following factors: (1) Goals, objectives and outputs; (2) Location and size; and (3) Adjustments in management area boundaries or prescriptions.

Alternative F Scenario 1 would apply the management direction to all lynx habitat in LAUs and linkage areas. Under Alternative F Scenario 2 the management direction would only apply to occupied habitat. At this time the Beaverhead-Deerlodge, Bitterroot, Nez Perce, Salmon-Challis, Ashley and Bighorn NFs are unoccupied; therefore on these units may consider the management direction but would not have to apply it. Several mountain ranges on the Custer, Gallatin, Helena, and Lewis and Clark NFs are also unoccupied and the management direction would not have to be applied in these areas until lynx occupy the site.

Since Alternative F Scenario 2 could be applied to all units at some point in time, the following analyzes the effects on the planning area as a whole.

Factor 1: Goals, objectives, and output

The amendment would add one goal to forest plans; conserve Canada lynx. This goal is consistent with other goals in existing plans and other legal requirements to provide for habitat needs for threatened and endangered species. The proposal would add several objectives to the plans. These objectives require consideration of natural ecosystem process and functions and consideration of lynx habitat needs. The additional objectives provide more species specific guidance but do not alter the overall objectives to provide for habitat needs for threatened and endangered species.

The management direction would not substantially alter outputs for grazing, minerals, energy, transportation systems, developed recreation areas, such as ski areas or winter recreation. These activities would not be prohibited by the management direction; however, habitat needs for lynx would need to be considered when managing these resources.

Alternative F would limit precommercial thinning in some situations. Limiting precommercial thinning in lodgepole pine forests could affect LTSY because it reduces growth and yield on these sites. The Beaverhead-Deerlodge and the Bridger-Teton are the only units that have a majority of their precommercial thinning scheduled over the next ten years in lynx habitat and in lodgepole pine; therefore they are the only units

that may see a reduction to LTSY (Appendix K, Table K-5). However, under current programs, the units only have funding for about 34 percent of their thinning program, so it is difficult to tease out the effects from the management direction in this proposal from effects of budgets. In addition, under Alternative F, Standard VEG S5 allows for consideration of new information. Over the next ten years information may become available that indicates some precommercial thinning in lodgepole pine forests may be beneficial to snowshoe hare; therefore it is uncertain whether or not LTSY would be affected.

Both the Beaverhead-Deerlodge and Bridger-Teton National Forests are being revised. The Beaverhead-Deerlodge should complete the revision process in 2007. Their DEIS for the Forest Plan recognizes the cumulative contribution the Northern Rockies Lynx Amendment may have on reducing growth and yield (DEIS, page 326). The Bridger-Teton should complete its revision in 2008.

The ASQ should not be affected on any units because the management direction does not preclude timber harvest. Standards VEG S1 and S2 may defer regeneration harvest in some areas, but Guideline VEG G1 encourages projects creating winter snowshoe hare habitat where it is lacking. It is likely there would be no change in overall timber outputs, but there may be changes in what material is harvested and where.

Factor 2: Location and size

There are approximately 38.5 million acres within the 18 National Forests in the planning area. Of this, approximately 18 million acres or 48 percent has been mapped as lynx habitat (see table 3.1). Of the 18 million acres of mapped lynx habitat, approximately 8 million acres are in land allocations that allow for management actions. Therefore the management direction only affects about 20 percent of the planning area. In addition, except for precommercial thinning, the management direction generally does not preclude activities such as timber harvest, grazing, minerals and energy activities, recreation, etc. Instead the direction provides sideboards and considerations for future activities.

Factor 3: Adjustments to management area boundaries and prescriptions.

The management direction would apply to future decisions in lynx habitat and linkage areas throughout the planning area. The proposal does not change any Management Area (MA) designation.

The proposal does not change any management prescription, except to provide sideboards and considerations for lynx in the design of projects and activities. For example, a prescription in Management Area 24 on the Gallatin National Forest is to manage for orderly exploration and development of mineral resources while mitigating effects on renewable resources. The Goals, Objectives, Standards and Guidelines in Alternative F would not change this

prescription, but would add some additional considerations for exploration and development of minerals that occur in lynx habitat.

The only prescription that may be affected would be on those MAs that emphasize timber production and growth and yield. Precommercial thinning in lynx habitat in these MAs would be precluded. However, as noted above under current programs, the units only have funding for about 34 percent of their thinning program, so it is difficult to tease out the effects from the management direction in this proposal from effects of budgets.

Summary
Considering the three factors, this management direction would not be a significant change under NFMA to the 18 forest plans because (1) it does not significantly alter the long-term relationship between levels of multiple-use goods and services originally projected; instead it provides additional sideboards in the design of projects and activities; (2) it does not effect the entire land management plan - it affects a small portion, primarily those management areas suitable for timber management. Again, in general it does not preclude activities - except for precommercial thinning - but provides additional sideboards and considerations for project design.

Chapter 4 Consultation and Coordination

List of preparers

The following are members of the Core Team:

Name	Agency	Position	Years of Experience
Jon Haber	FS, R1	Project Manager 2001-3	22
Joan Dickerson	FS, R1	Assistant 2001-3 Team Leader 2003-5	20
Raymond Smith	FS, R1	Team Leader 2005-7	15
Tim Bertram	FS, R1	Wildlife biologist	26
Marcia Hogan	FS, R1	Public Affairs	25
Carol Goffe	FS, R1	Writer/editor	23
William Tanke	FS, R1	GIS	27

The following are members of the Interdisciplinary team

Name	Agency	Area of support	Years of Experience
Rick Anderson	FS, R1	Social	12
Carl Cain	FS, R1	Transportation	24
Kim Foiles	FS, R1	GIS	20
Joe Gurrieri	FS, R1	Minerals	2
Cliff Mitchell	FS, R1	Recreation	25
Terry Nevius	FS, R1	Range	10
Mike Niccolucci	FS, R1	Economics	20
Susan Rinehart	FS, R1	Botany	19
Laird Robinson	FS, R1	Public affairs	30
William Terrill	FS, R1	Forests	30

The following people provided technical support:

Name	Agency	Area of support
Brent Barney	FS, R4	Transportation
Larry Blocker	FS, R1	Recreation
Barry Bollenbacher	FS, R1	Silviculture
Fred Bower	FS, R1	Transportation
Renate Bush	FS, R1	FIA
Tom Buchta	FS, R4	Minerals

List of preparers

Name	Agency	Area of support
Jim Claar	FS, R1	Lynx
Tom Contreras	FS, R4	Recreation
Gary Dickerson	FS, R1	Silviculture
Ron Erickson	FS, R1	Land acquisition
John Favro	FS, R1	Recreation
Brian Ferguson	FS, R4	Silviculture
Jeff Foss	FS, R4	Planning
Bruce Fox	FS, R1	Range
Julie Grodie	FS, R2	Wildlife
Bob Hamner	FS, R4	Range
Mike Hillis	FS, R1	Wildlife and fire
Melody Holm	FS, R2	Minerals
David Iverson	FS, R4	Economics
Paul Langowski	FS, R2	Fire
Rick Lasko	FS, R1	Fire
Jack Losensky	Contract consultant	Fire
Renee Lundberg	FS, R1	FIA
Mark Jensen	FS, R1	Ecosystem analysis
Terry Knupp	FS, R1	Recreation
Pattie Koppenol	FS, R4	Fire
Cynthia Manning	FS, R1	Social
Kevin McKelvey	FS, RMRS	Lynx
Lynn Pisano-Pedigo	FS, R2	Public affairs
Chuck Quimby	FS, R2	Range
Mike Retzlaff	FS, R2	Economics
Tom Rhode	FS, R1	Planning
John Rupe	FS, R2	Planning
Ed Ryberg	FS, R2	Recreation
Julie Schaefers	FS, R2	Social
Bruce Short	FS, R2	Silviculture
Helen Smith	FS, RMRS	Fire
John Squires	FS, RMRS	Lynx
Leslie Vaclulik	FS, R1	Minerals
Francisco Valenzuela	FS, R2	Recreation
Greg Warren	FS, R2	Planning

The following people are members of the lynx biology team (members who wrote the Lynx Conservation Assessment and Strategy), and who provided technical clarifications on the LCAS:

Name	Agency
Kurt Broderdorp	FWS – R6
Jim Claar	FS – R1
Steve Gniadek	NPS – Glacier NP
Brian Holt	FWS – R1
Steve Mighton	FS – R9
Bob Naney	FS – R6
Joel Trick	FWS – R3
Anne Vandehey	FWS – R6
Fred Wahl	FS – WO
Nancy Warren	FS – R2
Dick Wegner	FS – R2
Joyce Whitney	BLM – Washington
Tom Wittinger	FS – R1

The following people are members of the oversight advisory group:

Name	Agency	Area of support
Pam Gardener	FS, R1	Planning
Cindy Swanson	FS, R1	Wildlife
Becky Aus	FS, R2	Planning
Marisue Hillard	FS, R2	Wildlife
Bill LeVere	FS, R4	Wildlife
Steve Solem	FS, R4	Planning

The Lynx and Wolverine Steering Committee, chaired by Kathy McAllister, R1 Deputy Regional Forester, also provided oversight and guidance. The Committee is an interagency committee comprised of FS, BLM, Park Service, FWS, and state representatives. The committee coordinates efforts for compiling scientific data, identifying and prioritizing research needs, recommending conservation measures, and updating existing plans.

Distribution List

County commissions — Idaho

Adams
Bear Lake
Benewah
Blaine
Boise
Bonner
Bonneville
Boundary
Butte
Caribou
Clark
Clearwater
Custer
Idaho
Jefferson
Kootenai
Latah
Lemhi
Lewis
Madison
Nez Perce
Shoshone
Teton
Valley

County commissions — Montana

Beaverhead
Broadwater
Carbon
Cascade
Chouteau
Deer Lodge
Fergus
Flathead
Gallatin
Glacier
Golden Valley
Granite
Jefferson
Judith Basin
Lake
Lewis and Clark
Lincoln
Madison
Meagher
Mineral
Missoula
Park
Pondera
Powell
Ravalli
Sanders
Silver Bow
Stillwater
Sweet Grass
Teton
Wheatland
Yellowstone

County commissions - Utah

Daggett
Duchesne
Summit
Uintah
Utah
Wasatch

County commissions – Washington

Pend Oreille

County commissions – Wyoming

Big Horn
Freemont
Hot Springs
Johnson
Lincoln
Park
Sheridan
Sublette
Teton

Federal agencies

Army Corps of Engineers, Planning Division North Pacific Division
BLM Director's Office
BLM Idaho State Office
BLM Montana/Dakota State Office
BLM Utah State Office
BLM Wyoming State Office
Bureau of Reclamation
Environmental Protection Agency, Office of Federal Activities
Environmental Protection Agency, Region VIII
Environmental Protection Agency, Region VIII, Montana Office
Environmental Protection Agency, Region X
Federal Highway Administration, Western Region
HQ-USAF/LEEV, Environmental Division
National Park Service, Environmental Quality Division
National Park Service, Intermountain Region
National Park Service, Pacific West Region
Office of Deputy A/S of the USAF, Environment, Safety, Occupational Health
U.S. Department of Energy, Office of Environmental Compliance
U.S. Fish and Wildlife Service, Division of Environmental Coordination
U.S. Fish and Wildlife Service, Montana Field Office
U.S. Fish and Wildlife Service, Snake River Field Office
U.S. Fish and Wildlife Service, Wyoming Field Office
U.S. Fish and Wildlife Service, Region 1
U.S. Fish and Wildlife Service, Region 6
U.S. Geological Survey, Environmental Affairs Program
USDA Forest Service Environmental Coordination
USDA National Agricultural Library
USDA NRCS Meeteetse Conservation District
USDA Office of Civil Rights
USDA Pacific West area—Range sheep production unit

USDI Natural Resources Library
USDI Office of Environmental Policy and Compliance
USDI Office of External and Intergovernmental Affairs

State agencies

Governor of Idaho
Idaho Office of Species Conservation
Idaho Department of Fish and Game
Idaho Department of Parks and Recreation
Idaho Department of Transportation

Governor of Montana
Montana Department of Natural Resources and Conservation
Montana Fish, Wildlife and Parks

Governor of Utah
Utah Department of Natural Resources

Governor of Wyoming
Wyoming Office of Federal Policy
Wyoming Business Council
Wyoming Department of Agriculture
Wyoming Department of Parks and Cultural Resources
Wyoming Game and Fish Department
Wyoming State Forestry Division

Tribal governments

Arapahoe Business Committee
Blackfeet Tribal Business Council
Chippewa Cree Business Committee
Coeur d'Alene Tribe
Confederated Salish & Kootenai Tribes
Crow Tribal Council
Fort Belknap Community Council
Goshute Indian Tribe
Kalispell Tribe
Kootenai Tribal Council
Nez Perce Tribal Executive Committee
Northern Cheyenne Tribal Council
Northwest Band of Shoshoni Nation
Shoshone Business Council
Shoshone-Bannock Business Council
Shoshone-Paiute Tribes
Skull Valley Band of Goshutes
Tribal Council of the Te-Moak Western Shoshone
Ute Indian Tribe

United States representatives and senators

U.S. Representative Rob Bishop
U.S. Representative Chris Cannon
U.S. Representative Barbara Cubin
U.S. Representative Jim Matheson
U.S. Representative Dennis Rehberg
U.S. Representative Bill Sali
U.S. Representative Michael Simpson

U.S. Senator Max Baucus
U.S. Senator Robert Bennett
U.S. Senator Mike Crapo
U.S. Senator Larry Craig
U.S. Senator Michael Enzi
U.S. Senator John Tester
U.S. Senator Craig Thomas
U.S. Senator Orrin Hatch

Organizations, businesses and others

Access for All
All Transportation Service, Inc.
Alliance for the Wild Rockies
America Outdoors
American Avalanche Institute, Inc.
American Council of Snowmobile Associations
American Society for Prevention of Cruelty to Animals
American Wildlands
Anaconda Snowmobile Club

Animal Protection Institute
Animal Voices
Antelope Butte Ski Area
Associated Logging Contractors
Back Country ATV Association, Inc.
Back County ATV Association
Beaverhead Sno-Riders
Big Hole Snowmobile Club
Big Horn County Government Coalition
Big Horn Mountain Snowmads
Big Horn Snow-Goers
Big Sky Country Trail Preservers
Big Sky Snowriders
Bighorn Ski Area
Biodiversity Legal Foundation
Bitterroot Cross-Country Ski Club
Bitterroot Ridgerunners Snowmobile Club
Bjork, Lindley, Danielson & Little, P.C.
Blacktail Mountain Ski Area
Blue Ribbon Coalition
Blue Ribbon Coalition, Inc.
Blue Ribbon Flies
Bluewater Network
Bohart Ranch
Boone & Crockett Club
Boundary Backpackers
Bradford Environmental Research Institute
Bridger Bowl Ski Area
Broadwater County Snowmobile Club
Broadwater Rod & Gun Club
Cabinet Backcountry Horsemen
Cabinet Ridge Riders
Campbell County Sno-Goers
Capital Trail Vehicle Association
Caribou County Sun
Casper Snow Gypsies
Center for Native Ecosystems
Central Montana Wildlands Association
Circle Snowmobile Club
City of Salmon
City of Stanley

Citizens for a User Friendly Forest
Clearwater Elk Recovery Team
Cody Country Krazy Sledders
Cody Nordic Ski Foundation
Coeur d'Alene Snowmobile Club
Cold Mountain, Cold Rivers
Colorado Off Highway Vehicle Coalition
Colorado State University
Committee For Idaho's High Desert
Conner Enterprises, Inc.
Cut Bank Snowmobile Club
Deer Lodge Snowmobile Club
Defenders of Wildlife
Discovery Basin Ski Corporation
Donnelly Snowmobile Club
Doney Law Firm
Dragging Y Cattle Company
Dubois Snokaters Snowmobile Club
East Pioneer Experimental Stewardship Program
Ecosystem Management Research Institute
Elkins Resort
Environmental Sciences, UMW
F.H. Stoltze Land and Lumber Company
Flathead Audubon Society
Flathead County Parks & Recreation
Flathead Resource Organization
Flathead Snowmobile Association
Flying B Ranch
Franklin County High markers
Friends of Georgia
Friends of Pathways
Friends of the Clearwater
Friends of the King's Pond
Friends of the West
Friends of the Wild Swan
Fund for Animals, Inc.
Gallatin Valley Snowmobile Association
Gillette Internal Medicine Associates
Glacier County Title Company
Glacier Wilderness Resort
Grand Targhee Ski & Summer Resort

Great Burn Study Group
Great Falls Cross Country Club
Greater Yellowstone Coalition
Habitat Concepts, Inc.
Hagenbarth Livestock
Harriman State Park
Helena Snowdrifters
High Country Snowmobile Club
High Mountain Heli-Skiing
High Mountain Trail Association
High Mountain Trail Machine Association
High Uintas Preservation Council
Hills Resort
Humane Society of the United States
Hungry Horse Films
Idaho Cattle Association
Idaho Conservation League
Idaho County Snowmobile Advisory Commission
Idaho Environmental Council
Idaho Farm Bureau — Custer County
Idaho Farm Bureau Federation
Idaho Forest Owners Association
Idaho Groomer Advisory Board — Shoshone County
Idaho Groomer Advisory Board — Lemhi County
Idaho Outfitters & Guides Association
Idaho State Snowmobile Association
Idaho Trails Council
Idaho Wildlife Federation
Idaho Wildlife Society
Idaho Women in Timber
Intermountain Forest Industry Association
International Snowmobile Manufacturing Association
Izaak Walton Inn
Jackson Hole Conservation Alliance
Jackson Hole Locals Coalition
Jackson Hole Ski Corporation
Judith River Farm
Kasino Club
Kelly Canyon Ski Area
Kettle Range Conservation Group
Kootenai Environmental Alliance

Kootenai Winter Sports
Last Chance Nordic Ski Club
Lazy 4W Ranch
Lewiston, ID and Clarkston, WA Chambers of Commerce
Libby Rod & Gun Club
Lincoln County Snowcats
Lone Mountain Guest Ranch
Lookout Pass Ski & Recreation Area
Lost Trail Powder Mountain
Louisiana Pacific
Madison County Commissioners
Marion County Humane Society
Marshall Mountain Ski Corporation
Maverick Mountain
Meagher County Little Belters
Medicine Wheel Snogoers
Meeteese Recreation District
Midland Empire Snowgoers
Mile High Nordic Ski Club
Mission Mountain Chapter of Audubon Society
Mission Mountain Snowmobile Club
Missoula City Council Member Lou Ann Crowley
Missoula Nordic Ski Club
Missoula Snowgoers
Moco Engineering and Fabrication
Monarch & Associates
Mountain Defense League
Montana Audubon Society
Montana Farm Bureau Federation
Montana House of Representative Daniel Fuchs
Montana Logging Association
Montana Mining Association, Missoula Chapter
Montana Multiple Use Association
Montana Night Riders
Montana Outfitter & Guide Association
Montana Public Lands Council
Montana River Action Network
Montana Shooting Sports Association
Montana Snowbowl
Montana Snowcat Club
Montana Snowmobile Association

Montana State Senator Jerry O'Neil
Montana Stockgrowers Association
Montana Trail Vehicle Riders Association
Montana Trails Association
Montana Trappers Association
Montana Wilderness Association
Montana Wildlife Federation
Montana Wildlife Society
Montana Wood Products Association
Montanans for Multiple Use
National Cattlemen's Beef Association
National Council of the Industry for Air and Stream Improvement, Clemson University
National Federation Wild Turkey
National Ski Area Association
National Trappers Association
Native Ecosystems Council
Native Forest Network Yellowstone Branch
Nature Conservancy
North Fork Preservation Association
North Palouse Veterinary Clinic
Northwoods Wilderness Recovery
Noxon Rod & Gun Club
NW Access Alliance
NW Ecosystem Alliance
NW Environmental Defense Center
Off-Highway Vehicles
Orofino Chamber of Commerce
Orofino Ridgerunners Snowmobile Club
Owens and Hurst Lumber Company
Pacific Northwest Trail Association
Park County Environmental Council
Petroleum Association of Wyoming
People for Wyoming
Phibbs Law Office P.C.
Ponderosa Snow Warriors
Powder River Snowbuffs
Predator Conservation Alliance
Priest Lake Chamber of Commerce
Priest Lake Golf Course
Priest Lake Trails Association
Public Lands Council

Purdy Ranches
Pyramid Mountain Lumber, Inc.
Red Lodge Mountain
Red Lodge Race Camp
Red Lodge Snowgoers
Resource Development Coordination Committee
Rich Ranch
Seeley Lake Driftriders
Sierra Club—Georgia Chapter
Sierra Club—Utah Chapter
Sierra Club—Wyoming Chapter
Sleeping Giant Corporation
Smokey Bear Ranch
Snow King Resort
Snowdrifters Snowmobile Club
Society for Conservation Biology
Southwestern Montana Stockman's Association
Snow Devils
Stanford University Biological Sciences
Steadman Diversities, Inc.
Stimson Lumber Company
Stoltze Lumber Company
Sublette Riders Association
Sundance Snowmobile Club
Swan View Coalition
Sweetgrass County Recreation Association
Ten Lakes Snowmobile Club
Teton Pass Ski Area, Inc.
The Big Mountain
The Lands Council
The National Outdoor Leadership School
The Wildlife Society
Thirteen Mile Farm
Three Rivers Timber, Inc.
Timberstone Handcrafted Log Homes
Treasure Mountain Ski Search
Turner Mountain
United Four Wheel Drive Association
University of Colorado At Boulder
University of Montana Wildlife Biology Program
Upper Yellowstone Snowmobile Club

Utah Environmental Alliance
Utah Environmental Congress
Utah Snowmobile Association
Utah Wildlife Federation
Valley Bank of Kalispell
Valley Cats
Vigilante Snowmobilers
Voyageur Outward Bound School
Wallace Family Foundation
Wasatch Powderbird Guides
West Yellowstone Chamber of Commerce
Western Environmental Law Center
Western Environmental Trade Association
Western Montana Fish & Game Association
Western Watershed Project
Western Wildlife Conservancy
White Pine Ski Area
Whitebark Pine Ecosystem Foundation
Wilderness Society
Wildlands Center for Preventing Roads
Wildlife Conservation Society
Wildlife Management Institute
Wildlife Society
WildWest Institute
Winter Riders, Inc.
Winter/Alpine Engineering Lab
Winter Wildlands Alliance
Wise River Jackpine Savages
Women in Timber, Kalispell
Woodland Management
Wyoming Outdoor Council
Wyoming Snowmobile Association
Wyoming People for the USA
Wyoming Trappers Association
Wyoming Wildlife Federation
Wyoming Wilderness Association
Yaak Valley Forest Council
Yellowstone Valley Audubon Society
Yostmark Backcountry Tours

Glossary

Age class – An age class is an age grouping of trees according to an interval of years, usually 20. The trees are within 20 years of the same age, 1-20 years, 21-40 years, etc.

Allotment (range allotment) – An allotment is the area designated for grazing by a certain number of livestock for a given period.

Area of consistent snow compaction – An area of consistent snow compaction is an area of land or water that during winter is generally covered with snow and gets enough human use that individual tracks are indistinguishable. In such places, compacted snow is evident most of the time, except immediately after (within 48 hours) snowfall. These can be areas or linear routes, and are generally found in or near snowmobile or cross-country ski routes, in adjacent openings, parks and meadows, near ski huts or plowed roads, or in winter parking areas. Areas of consistent snow compaction will be determined based on the acreage or miles used during the period 1998 to 2000.

BA (Biological Assessment) – BA "refers to the information prepared by or under the direction of the Federal agency concerning listed and proposed species and designated and proposed critical habitat that may be present in the action area and the evaluation (of) potential effects of the action on such species and habitat." (50 CFR Part 402.02)

BO (Biological Opinion) – BO "is the document that states the opinion of the (US Fish and Wildlife) Service as to whether or not the Federal action is likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat." (50 CFR Part 402.02)

Broad scale assessment – A broad scale assessment is a synthesis of current scientific knowledge, including a description of uncertainties and assumptions, to provide an understanding of past and present conditions and future trends, and a characterization of the ecological, social, and economic components of an area. (LCAS)

Browse – Browse is the twigs, leaves, and young shoots of trees and woody shrubs that animals eat or browse upon.

Canopy – The canopy is the part of any stand of trees represented by the crowns. It usually refers to the topmost layer.

Carr – A carr is a deciduous woodland or shrub land occurring on permanently wet, organic soil. (Helms 1998 and LCAS)

Cavity – A cavity is a hole in a tree often used by wildlife, usually birds, for nesting and roosting.

Climax – Climax is the culminating stage in plant succession for a given site. Climax vegetation is stable, self-maintaining, and self-reproducing.

Coarse woody debris – Coarse woody debris is large pieces of dead woody

material, such as dead tree trunks, limbs, and root masses on the ground or in streams. (Helms 1998 and LCAS)

Commercial thinning - Commercial thinning is tree thinning where the cut trees are sold.

Commercial products, commercial timber sale - Commercial products are timber products that can be sold. A commercial timber sale is cutting and selling trees as timber products, bringing revenue to the government.

Condition class - Condition class is a description of how the land has departed from historic conditions based on the number of missed fire cycles (average fire-return intervals) and the amount of change in forest structure and species composition. (Schmidt et al. 2002)

Conifer - A conifer is a tree that produces cones, such as a pine, spruce, or fir. Most conifers have needles instead of leaves.

Coniferous - A coniferous forest is one consisting primarily of conifer trees.

Connectivity (of habitats) - Connectivity is the linkage of similar but separated vegetation stands by patches, corridors, or "stepping stones" of like vegetation. This term can also refer to the degree to which similar habitats are linked.

Cover - Cover is any feature that conceals wildlife or fish. Cover may be dead or live vegetation, boulders, or undercut stream banks. Animals use cover to escape from predators, rest, or feed.

Cover type - Cover type refers to stands of a particular vegetation type that are composed of similar species. The aspen cover type contains plants distinctly different from the subalpine fir cover type.

Crown - The crown is the top part of a tree where the leaves or needles grow.

Crown fire - A crown fire is the movement of fire through the crowns of trees or shrubs more or less independently of a surface fire. When the crown burns, the tree usually dies. (National Wildfire Coordinating Group 1996)

Cumulative effects - Cumulative effects are environmental consequences that result from the incremental impact of an action added to other past, present, and reasonably foreseeable future actions, regardless of which federal or non-federal agency or person takes such action(s). Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. (40 CFR 1508.7)

Daylight thinning - Daylight thinning is a form of precommercial thinning that removes trees and brush inside a given radius around a tree.

Decommission - To decommission is to stabilize and restore unneeded roads to a more natural state (36 CFR 212.1), or to permanently remove roads and their roadbeds.

Denning habitat (lynx) - Denning habitat is the environment lynx use when giving birth and rearing kittens until they are mobile. The most common component is large amounts of coarse woody debris to provide escape and thermal cover for kittens. Denning habitat must be within daily travel distance of winter snowshoe hare habitat - the typical maximum daily

distance for females is about three to six miles. Denning habitat includes mature and *old growth* forests with plenty of coarse woody debris. It can also include young regenerating forests with piles of coarse woody debris, or areas where down trees are jack-strawed.

Designated over–the–snow routes – Designated over-the-snow routes are routes managed under permit or agreement or by the agency, where use is encouraged, either by on-the-ground marking or by publication in brochures, recreation opportunity guides or maps (other than travel maps), or in electronic media produced or approved by the agency. The routes identified in outfitter and guide permits are designated by definition; groomed routes also are designated by definition. The determination of baseline snow compaction will be based on the miles of designated over-the-snow routes authorized, promoted, or encouraged during the period 1998 to 2000.

Designated play areas – Designated play areas are places identified for winter recreation, such as inner-tubing or snowmobiling, but which are not developed ski areas.

Designated route – A designated route is a road or trail that has been identified as open for specified travel use.

Developed recreation – Developed recreation requires facilities that result in concentrated use. For example, skiing requires lifts, parking lots, buildings, and roads; campgrounds require roads, picnic tables, and toilet facilities.

Development, mineral – Development is the work required to prepare a mineral deposit for production. This may include driving underground workings, stripping the overburden from deposits that will be open-pit or strip mined, building waste dumps and constructing milling and transporting facilities. Oil or gas development occurs through a series of production wells.

Developmental allocations – Developmental allocations are the allotments of federal lands made in land management plans that allow developments like campgrounds and active management like timber sales.

Direct effects – Direct effects are caused by an action and occur at the same time and place. (40 CFR 1508.8)

Dispersed recreation – Dispersed recreation is a form of outdoor recreation taking place away from the developed sites or areas that support concentrated recreational use. It may require facilities for keeping visitors safe, protecting resources and enhancing the quality of the visitor experience. (LCAS) It includes activities like hunting, backpacking, and scenic driving.

Disturbance – A disturbance is any event that alters the structure, composition, or function of a habitat. Natural disturbances include drought, floods, wind, wildfires, wildlife grazing, insects, and pathogens. Human-caused disturbances include timber harvest, wildland fire use, livestock grazing, road construction, and the introduction of exotic species. (LCAS)

Ecological process **–** An ecological process is the flow and cycling of energy, materials, and organisms through an ecosystem. (LCAS)

Even-aged harvest **–** Even-aged harvest is timber cutting that creates stands of trees essentially all the same age. Clearcuts and seed tree cuts are examples of even-age harvest.

Exploration, mineral **–** Exploration is physically searching for minerals. It often includes building roads, drill pads, underground workings, and trenching.

Fire behavior **–** Fire behavior is how fire reacts to fuel, weather, and topography. (National Wildfire Coordinating Group 1996)

Fire frequency **–** Fire frequency is how often fire burns a given area, often termed the *fire-return interval*.

Fire regime **–** Fire regime is a general description of the characteristic pattern of fire: how often (frequency); how hot (intensity); and how big (scale). (Fischer and Bradley 1987; Smith and Fisher 1997; Jones and Barrett, in press)

Fire risk **–** The fire risk is the likelihood a fire would occur in an area based on the historic fire record data, and defined in terms of whether a stand supports crown fire.

Fire use **–** Fire use is the combination of wildland fire use and using prescribed fire to meet resource objectives. (National Interagency Fire Center 1996)

Firebreak **–** A firebreak is a natural or constructed discontinuity in potential fuels that segregates, stops, and controls the spread of fire or provides a control line from which to control the fire. (Helms 1998)

Forage **–** Forage is the browse and non-woody plants eaten by wildlife and livestock.

Foraging habitat (lynx) **–** Foraging habitat is habitat that supports lynx primary prey – snowshoe hare – and alternate prey, especially red squirrels. The highest quality snowshoe hare habitat contains a high density of young trees or shrubs that are tall enough to protrude above the snow in winter. Red squirrel densities tend to be highest in mature cone-bearing forests with substantial quantities of coarse woody debris. (LCAS)

Forb **–** A forb is a broadleaf plant with little or no woody material in it.

Forest highway **–** A forest highway is a forest road under the jurisdiction of, and maintained by, a public authority and open to public travel (USC: Title 23, Section 101(a)), designated by an agreement with the FS, state transportation agency, and Federal Highway Administration.

Forest road **–** Any road wholly or partly within, or adjacent to, and serving the NF road system and which is necessary for the protection, administration, and utilization of the NF system and the use and development of its resources. (FSM 7705)

Forested stringer **–** A forested stringer is a narrow band of trees that connects to other patches of trees.

Fuel loading – Fuel loading is the amount of fuels on the forest floor, generally consisting of dead needles, twigs, branches, and logs.

Fuel treatment – A fuel treatment is a management action that reduces the threat of ignition, fire intensity, or rate of spread, or is used to restore fire-adapted ecosystems.

Goal – A goal is a broad description of what an agency is trying to achieve, found in a land management plan. (LCAS)

Gramminoid – Grasses and grass-like plants.

Groomed route – Groomed routes are designated over-the-snow routes on which the snow surface is packed, leveled or scarified, with or without "set tracks", usually by equipment towed behind a snowmobile or snow-cat. Snow roads maintained by permitted snow-cat tours are considered groomed routes. The determination of the maximum miles of groomed routes will be based on the maximum number of miles authorized, promoted, or encouraged during the period 1998 to 2000.

Guideline – A guideline is a particular management action that should be used to meet an objective found in a land management plan. The rationale for deviations may be documented, but amending the plan is not required. (LCAS modified).

Habitat connectivity (lynx) – Habitat connectivity consists of an adequate amount of vegetative cover arranged in a way that allows lynx to move around. Narrow forested mountain ridges or shrub-steppe plateaus may serve as a link between more extensive areas of lynx habitat; wooded riparian areas may provide travel cover across open valley floors. (LCAS)

Healthy Forests Restoration Act (HFRA) - Public Law 108-148, passed in December 2003. The HFRA provides statutory processes for hazardous fuel reduction projects on certain types of at-risk National Forest System and Bureau of Land Management lands. It also provides other authorities and direction to help reduce hazardous fuel and restore healthy forest and rangeland conditions on lands of all ownerships. (Modified from the Forest Service HFRA web site.)

Highway – The word *highway* includes all roads that are part of the National Highway System. (23 CFR 470.107(b)).

Home range – Home range is the area used by an individual in its normal activities of foraging, mating, and rearing its young, either during the entire year or seasonally. (LCAS)

Horizontal cover – Horizontal cover is the visual obscurity or cover provided by habitat structures that extend to the ground or snow surface primarily provided by tree stems and tree boughs, but also includes herbaceous vegetation, snow, and landscape topography.

HUC (Hydrologic unit code) – HUCs are a hierarchical coding system developed by the U.S. Geologic Survey to identify the geographic boundaries of watersheds of various sizes. The Columbia River is a 1st–code HUC, draining more than 165,000,000 acres. The Lower Snake River,

one of the Columbia's major tributaries, is a 2nd-code HUC, draining more than 22,000,000 acres; the Salmon River is a 3rd code HUC, draining almost 9,000,000 acres; and the Upper Grande Ronde River is a 4th-code HUC, draining just over 1,000,000 acres.

Indirect effects – Indirect effects are caused by an action and are later in time or further removed in distance, but are still reasonably foreseeable. (40 CFR 1508.8)

Isolated mountain range – Isolated mountain ranges are small mountains cut off from other mountains and surrounded by flatlands. On the east side of the Rockies, they are used for analysis instead of sub-basins. Examples are the Little Belts in Montana and the Bighorns in Wyoming.

Ladder fuels – Ladder fuels consist of vegetation below the tree crowns, which can carry fire from the forest floor into the crowns. Ladder fuels may be low branches, shrubs, or smaller trees, or dead material that has not yet fallen to the forest floor.

Land ownership adjustments – Adjusting land ownership means NFS lands are sold or exchanged, or private lands are acquired, so the landowner changes.

Landscape connectivity – see habitat connectivity

LAU (Lynx Analysis Unit) – An LAU is an area of at least the size used by an individual lynx, from about 25 to 50 square miles (LCAS). An LAU is a unit for which the effects of a project would be analyzed; its boundaries should remain constant.

Leasable minerals – Leasable minerals are federally owned fossil fuels (oil, gas, coal, oil shale, etc.), geothermal resources, sulfur, phosphates and uranium.

Linkage area – Linkage areas provide connectivity between blocks of lynx habitat. Linkage areas occur both within and between geographic areas, where basins, valleys, or agricultural lands separate blocks of lynx habitat, or where lynx habitat naturally narrows between blocks. (LCAS updated definition approved by the Steering Committee 10/23/01).

Locatable minerals – Locatable minerals are deposits such as gold, silver, copper, and other metals.

Low speed, low traffic volume road – *Low speed* is less than 20 miles per hour; *low volume* is a seasonal average daily traffic load of less than 100 vehicles per day.

Lynx habitat – Lynx habitat occurs in mesic coniferous forest that experience cold, snowy winters and provide a prey base of snowshoe hare. In the northern Rockies, lynx habitat generally occurs between 3,500 and 8,000 feet of elevation, and primarily consists of lodgepole pine, subalpine fir, and Engelmann spruce. It may consist of cedar-hemlock in extreme northern Idaho, northeastern Washington and northwestern Montana, or of Douglas-fir on moist sites at higher elevations in central Idaho. It may also consist of cool, moist Douglas-fir, grand fir, western larch, and aspen when interspersed in

subalpine forests. Dry forests do not provide lynx habitat. (LCAS)

Lynx habitat in an unsuitable condition – Lynx habitat in unsuitable condition consists of lynx habitat in the stand initiation structural stage where the trees are generally less than ten to 30 years old and have not grown tall enough to protrude above the snow during winter.

Stand replacing fires or certain vegetation management projects can create unsuitable conditions. Vegetation management projects that can result in unsuitable habitat include clearcuts and seed tree harvest, and sometimes shelterwood cuts and commercial thinning, depending on the resulting stand composition and structure (LCAS).

Maintain – In the context of this amendment, *maintain* means to provide enough lynx habitat to conserve lynx. It does not mean to keep the status quo.

Maintenance level – Maintenance levels define the level of service provided by and maintenance required for a road. (FSH 7709.58, Sec 12.3)

Maintenance level 1 – Maintenance level 1 is assigned to intermittent service roads when they are closed to vehicular traffic for more than one year. Such roads may be open to and suitable for non-motorized use. Basic custodial maintenance is performed to perpetuate the road and to keep the damage to adjacent resources to an acceptable level, with the emphasis on maintaining drainage facilities and runoff patterns. Planned road deterioration may occur.

Maintenance level 2 – Maintenance level 2 is assigned to roads open for use by high-clearance vehicles, where passenger car traffic is not a consideration. Traffic is normally minor, usually consisting of administrative, permitted, dispersed recreation, or other specialized uses. Log haul may occur at this level.

Maintenance level 3 – Maintenance level 3 is assigned to roads that are open to and maintained for travel by a prudent driver in a standard passenger car. User comfort and convenience are not considered priorities. Roads are typically low speed, single lane with turnouts and spot surfacing. Some roads may be fully surfaced with native or processed material.

Maintenance level 4 – Maintenance level 4 is assigned to roads that provide a moderate degree of user comfort and convenience at moderate travel speeds. Most roads are double lane and aggregate surfaced. Some may be single lane; some may be paved or have dust abated.

Maintenance level 5 – Maintenance level 5 is assigned to roads that provide a high degree of user comfort and convenience. Normally, roads are double-lane and paved, but some may be aggregate surfaced with the dust abated.

Management action – A management action is any activity undertaken as part of the administration of public lands.

Management direction – Management direction is a formal statement of goals

and objectives, and the associated standards and guidelines for obtaining them, found in a land use or other plan, law, or other guiding document.

Map & field-validate – To *map* is to identify and locate certain conditions on a map. To *field-validate* is to sample on the ground a representative number of areas, using an acceptable sampling method, to make sure the mapped areas truly contain the conditions that were mapped. Not every acre has to be field-validated.

Mesic – *Mesic* describes environmental conditions with a medium supply of moisture, as opposed to *xeric* (dry) or *hydric* (wet).

Mid-seral or later – Mid-seral is the successional stage in a plant community that is the midpoint as it moves from bare ground to climax. For riparian areas, it means willows or other shrubs have become established. For shrub-steppe areas, it means shrubs associated with climax are present and increasing in density.

Mineral materials – Mineral materials are common materials such as stone, gravel, clay, cinders, and decorative rock.

Mitigation – Mitigation is an action taken to avoid, minimize, or repair the impact of a management activity.

Mixed-severity fire regime – A fire regime where a mix of understory and stand-replacing fires burn about every 35 to 100 years, or intermediate-intensity fires may burn, which kill fire-susceptible trees while the fire-resistant trees survive.

Multistoried – A multistoried forest is one with both an *overstory* of tall trees and a dense undergrowth, or *understory*, of shorter trees and shrubs.

Multi-story mature or late successional forest – This stage is similar to the *old multistory structural* stage (see below). However, trees are generally not as old, and decaying trees may be somewhat less abundant.

No-action alternative – The no-action alternative means taking no action to resolve the problem described in the purpose & need. It represents the most likely condition expected to exist in the future if current management practices continue unchanged.

Non-developmental allocations – Non-developmental allocations are the allotments of federal lands made in land management plans where natural disturbance processes predominate and active management, like timber sales, may <u>not</u> occur. Allocations generally include wilderness, roadless, and semi-primitive non-motorized areas.

Objective – An objective is a statement in a land management plan describing desired resource conditions and intended to promote achieving programmatic goals. (LCAS)

Old multistory structural stage – Many age classes and vegetation layers mark the old forest, multistoried stage. It usually contains large old trees. Decaying fallen trees may be present that leave a discontinuous overstory canopy. On cold or moist sites without frequent fires or other disturbance, multi-layer stands with

large trees in the uppermost layer develop. (Oliver and Larson, 1996)

Old growth **–** Old growth forests generally contain trees that are large for their species and the site, and are sometimes decadent with broken tops. Old growth often contains a variety of tree sizes, large snags, and logs, and a developed and often patchy understory.

Old forest, multistoried structural stage **–** Many age classes and vegetation layers mark the old forest, multistoried stage, and it usually contains large old trees. Decaying fallen trees may also be present that leave a discontinuous overstory canopy. On cold or moist sites without frequent fires or other disturbance, multi-layer stands with large trees in the uppermost layer develop. (Oliver and Larson, 1996)

Old forest, single-storied structural stage Old forest, single-storied stage usually contains large old trees with little understory. Decaying fallen trees may be present, leaving a discontinuous overstory canopy. A single-layer stand evolves under the influence of frequent, recurring surface fires or other disturbance. (Oliver and Larson, 1996)

Overstory **–** The overstory is the upper canopy layer; the plants below comprise the *understory*.

Peer review **–** Peer review is the independent consideration and evaluation of a scientific article by more than one other expert in the same field of study. If the reviewers find the article to be reasonable in its descriptions of research methods, findings, and conclusions, it has been *peer reviewed*. The reviewing experts must be independent of the author and should be anonymous. In a reputable scientific journal, an article will not be published until it has been peer reviewed.

Permanent development **–** A permanent development is any development that results in a loss of lynx habitat for at least 15 years. Ski trails, parking lots, new permanent roads, structures, campgrounds, and many special use developments would be considered permanent developments.

PCT (precommercial thinning) **–** Precommercial thinning is the mechanical removal of trees to reduce stocking and concentrate growth on the remaining trees, and not resulting in immediate financial return. (Helms 1998)

Predator – A predator is an animal that lives by preying on other animals.

Prescribed fire **–** A prescribed fire is any fire ignited as a management action to meet specific objectives. A written, approved prescribed fire plan must exist, and NEPA requirements met, before ignition. The term replaces *management ignited prescribed fire*. (National Wildfire Coordinating Group 1996)

Production, minerals **–** Producing minerals is removing the minerals from the ground, making them available for processing and consumption.

Programmatic – Programmatic is the broad management direction in land management plans. It provides the overall guidance for resource management programs, practices, uses, and protection measures. It differs from

project-level direction, which provides guidance about a certain project in a particular place.

Prospecting **–** Prospecting is finding an area with potential for mineral development. It takes place before *exploration*, and involves limited surface disturbance, such as geologic mapping, soil or water sampling, or collecting seismic data.

Public authority **–** A public authority is a federal, state, county, town or township, Indian tribe, municipal, or other local government or instrumentality thereof, with authority to finance, build, operate, or maintain highway facilities. (23 CFR 460.2(b))

Public road **–** A public road is any road or street under the jurisdiction of and maintained by a public authority and open to public travel. (FSM 7705)

Reclamation, minerals **–** Reclaiming means restoring areas disturbed by mineral exploration, development, and production.

Red squirrel habitat **–** Red squirrel habitat consists of coniferous forests of seed and cone-producing age that usually contain snags and downed woody debris, generally associated with mature or older forests.

Regeneration – Regeneration is the re-growth of trees on a disturbed or deforested site.

Regeneration harvest – Regeneration harvest is cutting trees and creating an entire new age class; an even-age harvest. The major methods are clearcutting, seed tree, shelterwood, and group selective cuts. (Helms 1998)

Release – To release means to remove the competing vegetation to allow a desired species to grow, similar to weeding a garden. A tree undergoes *release* when it re-enters a period of rapid growth after competing vegetation has been removed.

Research – Research consists of studies conducted to increase scientific knowledge or technology. For the purposes of Standards VEG S5 and VEG S6, *research* applies to studies financed from the forest research budget, and to administrative studies financed by the NF budget.

Responsible official – The responsible official is a federal employee who has been delegated the authority to make the decision about a specific planning action.

Restore, restoration – To restore is to return or re-establish ecosystems or habitats to their original structure and species composition. (Helms 1998)

Restoration tools – Restoration tools are actions such as prescribed fires or thinning used to modify an ecosystem to achieve a desired, healthy, and functioning condition.

Restricted road **–** A restricted road is a road or segment where a certain type of use or all uses are prohibited during certain seasons of the year, or yearlong.

Riparian area **–** A riparian area is the area of distinctive soil and vegetation between a stream or other body of water and the adjacent upland. It includes wetlands and the parts of the floodplains and valley

bottoms that support riparian vegetation (LCAS), which typically consists of various emergent aquatic plants, as well as the grasses, sedges, and shrubs that thrive close to water.

Road – A road is a motor vehicle travel way greater than 50 inches wide unless it is designated and managed as a trail. A road may be classified, unclassified, or temporary. (36 CFR 212.1)

Road density – Road density is the measure of the amount of roads in an area. It is typically reported in miles of road per square mile of land.

Road improvement – A road improvement changes a road so that its original design function is altered, its traffic-service level increases, or its capacity expands. (FSM 7705) Road *maintenance* has none of these results.

Road reconstruction – Road reconstruction is improving or realigning an existing classified road. (FSM 7700)

Roads Analysis Process – Roads analysis is a procedure for evaluating the ecologic, social, and economic impacts from roads and road systems. The analysis does not result in a decision, but helps inform management decisions.

Salvage harvest – Salvage harvest is a commercial timber sale of dead, damaged, or dying trees. It recovers economic value that would otherwise be lost. Collecting firewood for personal use is not considered salvage harvest.

Sapling – A sapling is a tree that is between one and five inches in diameter.

Security habitat (lynx) –Security habitat amounts to places in lynx habitat that provide secure winter bedding sites for lynx in highly disturbed landscapes like ski areas. Security habitat gives lynx the ability to retreat from human disturbance. Forest structures that make human access difficult generally discourage human activity in security habitats. Security habitats are most effective if big enough to provide visual and acoustic insulation and to let lynx easily move away from any intrusion. They must be close to winter snowshoe hare habitat. (Modified from LCAS)

Seedling – A seedling is a tree that is less than one inch in diameter.

Semi-primitive non-motorized – A way to characterize an area with a predominately natural or natural-appearing environment, where motorized use is not permitted.

Seral – Seral is a temporary, intermediate stage in the process of succession. (Helms 1998)

Shade tolerant – Shade tolerant is a plant species that does not require abundant sunlight to grow, such as cedar or hemlock.

Shrub steppe habitat – Shrub steppe habitat consists of dry sites with vegetation of intermingled shrubs and grasslands.

Site-specific – Site specific means tied to or involving a certain place. The term is applied to project analysis.

Ski area – A site and attendant facilities expressly developed to accommodate alpine or Nordic skiing. (LCAS)

Snowshoe hare habitat – Snowshoe hare habitat consists of places where young trees or shrubs grow densely; often thousands of woody stems per acre.

Special use authorization – A special use authorization is a permit, easement, or other written instrument that grants rights or privileges to occupy and/or use NFS land, subject to specified terms and conditions. (FSM 2705)

Stand – A stand is a group of trees occupying a certain area that is similar in species, age, and condition.

Stand composition – Stand composition is the proportion of each tree species expressed as a percentage of the total number, basal area, or volume of the stand. (Helms 1998)

Stand–replacing fire regime – A stand-replacing fire regime is one where infrequent, high-intensity fires burn about every 35 to 200+ years, killing most trees and substantially changing the forest structure.

Standard – A standard is a required action in a land management plan specifying how to achieve an objective or under what circumstances to refrain from taking action. A plan must be amended to deviate from a standard.

Stand initiation structural stage – The stand initiation stage develops after a stand-replacing disturbance by fire or regeneration timber harvest. A new single-story layer of shrubs, tree seedlings, and saplings establish and develop, reoccupying the site. Trees that need full sun are likely to dominate these even-aged stands. (Oliver and Larson, 1996)

Stand structure – Stand structure is the horizontal and vertical distribution of the components of a forest stand, including the height; diameter; crown layers and stems of trees, shrubs and the herbaceous understory; snags; and down woody debris. (Helms 1998)

Stem exclusion structural stage – In the stem exclusion stage, trees initially grow fast and quickly occupy all of the growing space, creating a closed canopy. Because the trees are tall, little light reaches the forest floor so understory plants (including smaller trees) are shaded and grow more slowly. Species that need full sunlight usually die; shrubs and herbs may become dormant. New trees are precluded by a lack of sunlight or moisture. (Oliver and Larson, 1996)

Succession – Succession is the natural replacement, in time, of one plant community with another. Conditions in the existing plant community (or successional stage) create conditions favorable for establishing the next stage.

Successional stage – A successional stage is a normal, expected phase in the development of a plant community as it moves from bare ground to climax. The grass-forb stage precedes the woody shrub stage.

Suitable timber base – The suitable timber base is the land that has been deemed appropriate for *timber management.*

Surface fire – A surface fire spreads through surface fuels, <u>not</u> into the upper branches and crowns of trees.

Surface fuels – Surface fuels are needles, leaves, grass, forbs, dead and down

branches and trees, stumps, shrubs, and short trees.

Temporary road – A temporary road is a road not intended to be a part of the forest transportation system and not needed for long-term resource management. (36 CFR 212.1, FSM 7705)

Thermal cover – Thermal cover is cover that helps protect animals from weather. It shields them from harsh winds and precipitation and helps them conserve body heat.

Timber management – Timber management consists of growing, tending, commercially harvesting, and regenerating crops of trees.

Transition zone – A transition zone is the area where the predominant species changes from one to another.

Two–aged harvests – Two-age harvests are clearcuts, seed tree cuts, and shelterwood cuts that retain some overstory trees. They retain structural diversity and result in a two-aged stand when an understory of younger trees begins to grow.

Type conversion – Type conversion is changing the dominant vegetation in a place from forested to non-forested, or from one species to another.

Understory – An understory consists of the trees and woody shrubs growing beneath the *overstory* in a stand of trees.

Understory fire regime – An understory fire regime is one where the understory burns frequently, from once a year to about every 35 years, with low-intensity surface fires that consume forest litter and kill small trees. Understory fires generally do not kill large, fire-resistant trees or substantially change the stand structure.

Understory re–initiation structural stage – In the understory reinitiation stage, a new age class of trees gets established after overstory trees begin to die, are removed, or no longer fully occupy their growing space after tall trees abrade each other in the wind. Understory seedlings then re-grow and the trees begin to stratify into vertical layers. A low to moderately dense uneven-aged overstory develops, with some small shade-tolerant trees in the understory. (Oliver and Larson, 1996)

Understory thinning – Understory thinning, or thinning from below, removes small trees growing under taller ones, to remove ladder fuels or to improve the health and vigor of the overstory. Understory thinning may or may not provide commercial products.

Uneven–aged harvest – Uneven-age harvests remove trees with commercial value either individually or in groups. A multi-age structure is maintained by removing some trees of all sizes and by regenerating the openings. Structural diversity is retained and the result is a stand with several age classes. *Uneven-aged management* creates multi-aged, multi-storied forests.

Unsuitable lynx habitat – Unsuitable lynx habitat consists of lynx habitat in the stand initiation structural stage where the trees are generally less than ten to 30 years old and have <u>not</u> grown tall enough to protrude above the snow during winter.

Stand replacing fires or certain vegetation management techniques can create unsuitable lynx habitat. Vegetation management projects that can result in unsuitable habitat include clearcuts and seed tree harvest, and sometimes shelterwood cuts and commercial thinning, depending on the resulting stand composition and structure (LCAS).

Unsuitable lands – Unsuitable lands have been classified as inappropriate to manage for a particular resource use. For the FS, *unsuitable lands* are those not managed for timber production for reasons of policy, ecology, technology, silviculture, or economics.

Valid existing rights – Valid existing rights are a definable legal interest established or existing through statute, real estate transactions, or federal grants or leases.

Vegetation management projects – Vegetation management consists of timber and fire management projects that change the composition and structure of vegetation to meet specific objectives, by means of prescribed fire, timber harvest, precommercial thinning, etc. For the purposes of this amendment, the term does not include removing vegetation for permanent developments like mineral operations, ski runs, roads and the like, and does not apply to fire suppression or wildland fire use.

Watershed – A watershed is the entire region drained by a waterway or into a lake or reservoir. Above a point on a stream, it is the area contributing water to the stream.

Wildland fire – A wildland fire is any fire burning in the wildlands that is not a prescribed fire or a structural fire. This term encompasses fires previously called *wildfires*. (National Interagency Fire Center 1998)

Wildland fire use – Wildland fire use is the managing of naturally ignited wildland fires to accomplish resource management objectives in areas that have a fire management plan. This term replaces *prescribed natural fire*. (Wildland and Prescribed Fire Management Policy, August 1998)

Willow carr – A willow carr consists of willows growing on permanently wet, organic soil.

Wildland urban interface (WUI) – (A) An area within or adjacent to an at-risk community that is identified in a community wildfire protection plan; or

(B) in the case where there is no wildfire protection plan in effect the WUI is:

(i) an area extending ½ mile from the boundary of an at-risk community;

(ii) an area within 1½ miles of the boundary of an at-risk community including land that has sustained steep slopes that create potential for wildfire behavior endangering the at-risk community, has a geographic feature that aids in creating an effective fire break, such as road or ridge top, or is in condition class 3; and

(iii) an area that is adjacent to an evacuation route for an at-risk community that requires hazardous fuel reduction to provide safer evacuation for the at-risk

community. (Healthy Forests Restoration Act)

Based on the HFRA definition above, the demarcation of the WUI is contingent upon many human and natural factors. So for the purposes of the Lynx EIS analysis the WUI was considered the zone within one mile of where people live, liberally measured as just one structure per ten square miles.

Winter snowshoe hare habitat – Winter snowshoe hare habitat consists of places where young trees or shrubs grow densely – thousands of woody stems per acre – and tall enough to protrude above the snow during winter, so hares can browse on the bark and small twigs (LCAS). Winter snowshoe hare habitat develops primarily in the stand initiation, understory reinitiation, and old forest multistoried structural stages.

Young regenerating forest – A young regenerating forest is a forest in the *stand initiation* structural stage

Young forest multistoried structural stage – In the young forest, multistoried stage, three or more layers of trees become established because of minor disturbances that cause some mortality in the overstory, perpetuating a multi-layer, multi-aged stand structure. A broken overstory layer with a mix of tree sizes characterizes this stage. Large trees are scarce. This stage likely has shade tolerant trees in the understory (Oliver and Larson, 1996).

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List of acronyms

Acronym	Title	What it is
AIRFA	American Indian Religious Freedom Act	Law
ASQ	Allowable Sale Quantity	Unit of measure
BA	Biological assessment	Document
BBER	Bureau of Business & Economic Research	Subset of Economics Department at University of Montana
BLM	Bureau of Land Management	USDI agency
BO	Biological opinion	Document
CEQ	Council on Environmental Quality	Federal department
CFR	Code of Federal Regulations	Set of regulations
DEIS	Draft environmental impact statement	Document
DNA	Deoxyribonucleic acid	Genetic material
DNRC	Department of Natural Resources and Conservation	State department
EIS	Environmental impact statement	Document
ESA	Endangered Species Act	Law
FIA	Forest inventory and analysis	Vegetation data
FLPMA	Federal Land Policy Management Act	Law
FS	Forest Service	USDA agency
FSH	Forest Service Handbook	Set of procedures
FSM	Forest Service Manual	Set of policies
FWS	U.S. Fish and Wildlife Service	USDI agency
GIS	Geographic information system	Mapping tool
HCP	Habitat conservation plan	Document
HFI	Healthy Forests Initiative	Set of guidance
HFRA	Healthy Forests Restoration Act	Law
HUC	Hydrologic unit code	Watershed descriptor
ID	Interdisciplinary "team"	Group of people
IMI	Inventory and Monitoring Institute	Administrative subset of FS
IMPLAN	Impact Analysis for Planning	Computer program
INFISH	Inland Native Fish Strategy	Document
LAU	Lynx analysis unit	Lynx habitat descriptor
LCAS	Lynx Conservation Assessment and Strategy	Document
LTSY	Long Term Sustained Yield	Unit of measure
MIS	Management indicator species	Plant or animal
MOU	Memorandum of understanding	Agreement
NEPA	National Environmental Policy Act	Law
NHPA	National Historic Preservation Act	Law
NF	National Forest	Administrative unit

Acronym	Title	What it is
NFMA	National Forest Management Act	Law
NIFC	National Interagency Fire Center	Administrative subset of FS & BLM
NRHP	National Register of Historic Places	
NWCG	National Wildfire Coordinating Group	Administrative working group
OHV	Off Highway Vehicle amendment	Document
PACFISH	Interim Strategy for Managing Anadromous Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California	Document
TEP	Threatened, endangered, proposed – also TEPS threatened, endangered, proposed and sensitive	Plant, animal or fish
TSMRS	Timber stand management record system	Data base
USDA	United States Department of Agriculture	Federal department
USDC	United States Department of Commerce	Federal department
USDI	United States Department of Interior	Federal department
USDL	United States Department of Labor	Federal department
WUI	Wildland urban interface	Area of land

Appendices

Appendix A – Crosswalk from the LCAS; to the scoping proposed action; the DEIS Proposed Action, Alternative B; and the FEIS Preferred Alternative, Alternative F Developing the scoping proposed action

The scoping proposed action was developed in September 2001 based on the recommendations in the Lynx Conservation Assessment and Strategy (LCAS). The recommendations were fine tuned to include only those items that are truly plan decisions, to reduce redundancy, and to provide clarity.

1) Plan decisions
Plan decisions guide or limit selection of projects. The following criteria were used to determine if direction in the LCAS was a plan decision:

Objectives

- Does it describe resources outcomes to achieve? If so, include.
- Does it describe how to map lynx habitat? If so, do not include, because how to map lynx habitat is an inventory process not a plan decision.
- Does it describe an analysis or planning process that should be conducted? Analysis processes are generally not plan decisions in that they do not set the framework for desired conditions, or sideboards for project implementation. However, include as a standard if the process is a prerequisite for a type of project.

Standards and Guidelines

- Does it set sideboards for project implementation? If so, include.

Some word changes were made to reflect plan decisions instead of a conservation strategy. For example, "conservation measures" were changed to "management direction."

2) Redundancy
Each recommendation was evaluated to see if it was already addressed by another recommendation, already addressed by manual or handbook direction, or could be combined. This occurred frequently because of the way the LCAS was organized.

3) Clarity
Some of the wording was changed to provide clearer direction based on the experience of using the LCAS over the last few years.

Developing the DEIS Proposed Action, Alternative B

During scoping, both the public and agency employees raised questions about the clarity of objectives, standards, and guidelines in the initial proposed action. The ID team found ways to reword them to make them clearer, without changing the intent or effects.

Some of the guidelines were rewritten to state them more clearly as guidelines; those actions that "should" be done a certain way, versus "must" be done that way. Others were added because they had been inadvertently omitted from the

original proposed action, or were modified in the LCAS after September 2001.

Developing the FEIS Preferred Alternative, Alternative F

Alternative F was developed for the Final Environmental Statement (FEIS) based on comments received from people and agencies who reviewed the DEIS. They suggested different objectives, standards, and guidelines, or different combinations of them, or they had concerns about the impacts the standards or guidelines might have (see *Response to Comments*, FEIS, Vol. 2). The FS considered these comments on the alternatives. We used these comments to revise and rearrange the standards and guidelines to create Alternative F. Along with the other alternatives, the effects of Alternative F are analyzed in full in Chapter 3 of the FEIS.

Table A-1. Crosswalk from the LCAS, to the scoping proposed action; the DEIS Proposed Action, Alternative B; and the FEIS Preferred Alternative, Alternative F

LCAS Recommendations	Scoping Proposed Action	DEIS Proposed Action, Alt B	FEIS Preferred Alternative F
All Programs			
Programmatic objectives for all			
1. Design vegetation management strategies that are consistent with historical succession and disturbance regimes. The broad-scale strategy should be based on a comparison of historical and current ecological processes and landscape patterns, such as age-class distributions and patch size characteristics. It may be necessary to moderate the timing, intensity, and extent of treatments to maintain all required habitat components in lynx habitat, to reduce human influences on mortality risk and interspecies competition, and to be responsive to current social and ecological constraints relevant to lynx habitat.	**Vege O3**. Design vegetation management practices, to the extent practicable, to be consistent with historical succession and disturbance regimes, while maintaining all required habitat components in lynx habitat. **Vege O1**. Maintain suitable acres and juxtaposition of lynx habitat through time, with an emphasis on continued availability of high quality foraging habitat in proximity to denning habitat. **Vege O5.** Design regeneration harvest, planting, and thinning to maintain or enhance dense horizontal cover of conifers for snowshoe hare habitat. In aspen stands intermixed with spruce-fir forests, particularly in southern Idaho, southern Montana, Wyoming, and Utah, treatments should result in dense regeneration of aspen.	**VEG O1.** Manage vegetation to be more similar to historic succession and disturbance processes while maintaining habitat components necessary for the conservation of lynx. **VEG O2.** Maintain or improve lynx habitat, emphasizing high-quality winter snowshoe hare habitat near denning habitat. **VEG O4.** Design regeneration harvest, reforestation and thinning to develop characteristics suitable for winter snowshoe hare habitat.	**VEG O1.** Manage vegetation to mimic or approximate natural succession and disturbance processes while maintaining habitat components necessary for the conservation of lynx. **VEG O2.** Provide a mosaic of habitat conditions through time that support dense horizontal cover, and high densities of snowshoe hare. Provide winter snowshoe hare habitat in both the stand initiation structural stage and in mature, multi-story conifer vegetation. **VEG O4.** Focus vegetation management in areas that have potential to improve winter snowshoe hare habitat but presently have poorly developed understories that lack dense horizontal cover.
Programmatic standards for all			
1. Conservation measures will generally apply only to the lynx habitat on federal lands within LAUs.	**All Programs S1.** Management direction applies only to lynx habitat within LAUs, or, where specified for some measures, applies where needed to address connectivity between LAUs. Management direction only applies to	Objectives, standards, and guidelines apply to the lynx habitat within LAUs as described in Features common to all alternatives.	Objectives, standards, and guidelines apply to the lynx habitat within LAUs as described in Features common to all alternatives.

LCAS Recommendations	Scoping Proposed Action	DEIS Proposed Action, Alt B	FEIS Preferred Alternative F
	management of federal lands. Note some management direction may require analysis beyond National Forest or BLM lands; however management constraints will only be applied to National Forest or BLM lands. LAU boundaries will not be adjusted except through agreement with the US Fish and Wildlife Service, based on new information on the presence or absence of lynx habitat within an LAU.		
2. Lynx habitat will be mapped using criteria specific for each geographic area to identify appropriate vegetation and environmental conditions. Primary vegetation includes those types necessary to support lynx reproduction and survival. It is recognized that other vegetation types that are intermixed with the primary vegetation will be used by lynx, but are considered to contributed to lynx habitat only where associated with the primary vegetation. Refer to glossary and descriptions for each geographic area.	Not included. *Initial mapping based on broad scale data is completed and will be refined at the project level. See Appendix B.*	Not included. *Initial mapping based on broad scale data is completed and will be refined at the project level. See Appendix B.*	Not included. *Initial mapping based on broad scale data is completed and will be refined at the project level. See Appendix B.*
3. To facilitate project planning, delineate LAUs. To allow for the assessment of potential effects of the project on an individual lynx, LAUs should be at least the size of area used by a resident lynx and contain sufficient year-round habitat.	Not included. *Initial mapping based on broad scale data is completed and will be refined at the project level. See Appendix B.*	Not included. *Initial mapping based on broad scale data is completed and will be refined at the project level. See Appendix B.*	Not included. *Initial mapping based on broad scale data is completed and will be refined at the project level. See Appendix B.*
4. To be effective for the intended purposes of planning and monitoring,	**All Programs S1.** Management direction applies only to lynx habitat	**LAU S1.** LAU boundaries will not be adjusted except through	**LAU S1.** Changes in LAU boundaries shall be based on site

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LAU boundaries will not be adjusted for individual projects, but must remain constant.	within LAUs, or, where specified for some measures, applies where needed to address connectivity between LAUs. Management direction only applies to management of federal lands. Note some management direction may require analysis beyond National Forest or BLM lands, however management constraints will only be applied to National Forest or BLM lands. LAU boundaries will not be adjusted except through agreement with the US Fish and Wildlife Service, based on new information on the presence or absence of lynx habitat within an LAU.	agreement with the US Fish and Wildlife Service, based on new information about lynx habitat.	specific habitat information and after review by the Forest Service Regional Office.
5. Prepare a broad-scale assessment of landscape patterns that compares historical and current ecological processes and vegetative patterns, such as age-class distributions and patch size characteristics. In the absence of guidance developed from such an assessment, limit disturbance within each LAU as follows: if no more than 30 percent of lynx habitat within an LAU is currently in unsuitable condition, no further reduction of suitable conditions shall occur as a result of vegetation management activities by federal agencies.	**Vege S1.** Unless a broad scale assessment has been completed that substantiates different historical levels suitable habitat, limit disturbance within each LAU as follows: if more than 30 percent of lynx habitat within an LAU is currently in unsuitable condition, no further reduction of suitable conditions shall occur as a result of vegetation management activities on National Forest or BLM lands.	**VEG S1.** Unless a broad scale assessment has been completed that substantiates different historic levels of unsuitable habitat, limit disturbance in each LAU as follows: If more than 30 percent of the lynx habitat in an LAU is currently in unsuitable condition, no additional habitat may be made unsuitable because of vegetation management projects.	**VEG S1. Where and how this Standard applies:** Standard VEG S1 applies to all vegetation management projects that regenerate forests, except for fuel treatment projects within the wildland urban interface (WUI) as defined by HFRA, subject to the following limitation: Fuel treatment projects within the WUI that do not meet Standards VEG S1, VEG S2, VEG S5, and VEG S6 may occur on no more that 6 percent (cumulatively) of the lynx habitat on each administrative unit (a unit is a National Forest). For fuel treatment projects within the WUI see guideline VEG G10. **The Standard:** Unless a broad scale assessment has been completed

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			that substantiates different historic levels of stand initiation structural stages, limit disturbance in each LAU as follows: If more than 30 percent of the lynx habitat in an LAU is currently in a stand initiation structural stage that does not yet provide winter snowshoe hare habitat, no additional habitat may be regenerated by vegetation management projects.
Programmatic guidelines for all			
1. The size of LAUs should generally be 6,500-10,000ha (16,000-25,000 acres or 25-50 square miles) in contiguous habitat, and likely should be larger in less contiguous, poorer quality, or naturally fragmented habitat. Larger units should be identified in the Southern Rocky Mountain Geographic Area. In the west it is recommended using watersheds, (e.g., 6th code hydrologic unit codes (HUCs) in more northerly portions of geographic areas, and 5th code HUCs in more southerly portions). Coordinate delineation of LAUs with adjacent administrative units and state wildlife management agencies, where appropriate.	Not included. *Initial mapping based on broad scale data is completed and will be refined at the project level. See Appendix B.*	Not included. *Initial mapping based on broad scale data is completed and will be refined at the project level. See Appendix B.*	Not included. *Initial mapping based on broad scale data is completed and will be refined at the project level. See Appendix B.*
2. LAUs with only insignificant amounts of lynx habitat may be discarded, or lynx habitat within the unit incorporated into neighboring LAUs. Based on studies at the southern part of lynx range in the	Not included. *The identification of the LAUs is completed (see Appendix B).*	Not included. *The identification of the LAUs is completed (see Appendix B).*	Not included. *The identification of the LAUs is completed (see Appendix B).*

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western U.S., it appears that at least 10 square miles of primary vegetation should be presented within each LAU to support survival and reproduction. The distribution of habitat across the LAU should consider daily movement distances of resident females (typically up to 3-6 miles).			
3. After LAUs are identified, their spatial arrangement should be evaluated. Determine the number and arrangement of contiguous LAUs needed to maintain lynx habitat well distributed across the planning area.	Not included. *The identification of the LAUs is completed (see Appendix B).*	Not included. *The identification of the LAUs is completed (see Appendix B).*	Not included. *The identification of the LAUs is completed (see Appendix B).*
Project standards for all			
1. Within each LAU, map lynx habitat. Identify potential denning habitat and foraging habitat (primarily snowshoe hare habitat, and also habitat for important alternate prey such as red squirrels), and topographic features that may be important for lynx movement (major ridge systems, prominent saddles, and riparian corridors). Also identify non-forested vegetation (meadows, shrub-grassland communities, etc.) adjacent to and intermixed with forest lynx habitat that may provide habitat for alternate lynx prey species.	Not included. *Initial mapping based on broad scale data is completed and will be refined at the project level. Identification of denning and forage habitat is implied in standards specific to those components*	Not included. *Initial mapping based on broad scale data is completed and will be refined at the project level. Identification of denning and forage habitat is implied in standards specific to those components.*	Not included. *Initial mapping based on broad scale data is completed and will be refined at the project level. Identification of denning and forage habitat is implied in standards and guidelines specific to those components.*
2. Within an LAU, maintain denning habitat in patches generally larger	**Vege S2.** Within an LAU, maintain at least 10 percent of the LAU in	**VEG S3**. Maintain at least ten percent of the lynx habitat in an LAU	**VEG G11.** Denning habitat should be distributed in each LAU in the

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than 5 acres, comprising at least 10 percent of lynx habitat. Where less than 10 percent denning habitat is currently present within an LAU, defer any management action that would delay development of denning habitat structure.	lynx denning habitat. Denning habitat patches generally should be larger than 5 acres in size. Where less than 10 percent denning habitat is currently present within an LAU, defer vegetative management practices in stands that have the highest potential for developing denning habitat structure in the future. NOTE: the intent is not to defer management actions where the denning habitat doesn't exist or won't exist in the near (20-30 yr future), but to defer in those stands that would provide denning in the near future (0-20 years).	as denning habitat in patches generally larger than five acres. Where less than ten percent denning habitat is present in an LAU, defer vegetation management projects in stands that have the highest potential to develop denning habitat.	form of pockets of large amounts of large woody debris, either down logs or root wads, or large piles of small wind thrown trees ("jack-strawed" piles). If denning habitat appears to be lacking in the LAU, then projects should be designed to retain some coarse woody debris, piles, or residual trees to provide denning habitat in the future.
3. Maintain habitat connectivity within and between LAUs.	**All Programs S2.** Maintain, and where necessary and feasible restore habitat connectivity within and between LAUs.	**ALL O1.** Maintain or restore lynx habitat connectivity in and between LAUs, and in linkage areas. **ALL S1.** New or expanded permanent developments and vegetation management projects must maintain habitat connectivity.	**ALL O1.** Maintain or restore lynx habitat connectivity in and between LAUs, and in linkage areas. **ALL S1.** New or expanded permanent developments and vegetation management projects must maintain habitat connectivity in an LAU and/or linkage area.
Timber management			
Programmatic objectives for timber management			
1. Evaluate historical conditions and landscape patterns to determine historical vegetation mosaics across landscapes through time. For example, large infrequent disturbance events may have been more characteristic of lynx habitat than small frequent disturbances.	Not included. *Evaluation of landscape patterns is in implied in vegetation standards.*	Not included. *Evaluation of landscape patterns is in implied in vegetation standards and guidelines.*	Not included. *Evaluation of landscape patterns is in implied in vegetation standards and guidelines.*

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2. Maintain suitable acres and juxtaposition of lynx habitat through time. Design vegetation treatments to approximate historical landscape patterns and disturbance processes.	**Vege O1.** Maintain suitable acres and juxtaposition of lynx habitat through time, with an emphasis on continued availability of high quality foraging habitat in proximity to denning habitat. **Vege O3.** Design vegetation management practices, to the extent practicable, to be consistent with historical succession and disturbance regimes, while maintaining all required habitat components in lynx habitat.	**VEG O1.** Manage vegetation to be more similar to historic succession and disturbance processes while maintaining habitat components necessary for the conservation of lynx. **VEG O2.** Maintain or improve lynx habitat, emphasizing high-quality winter snowshoe hare habitat near denning habitat.	**VEG O1.** Manage vegetation to mimic or approximate natural succession and disturbance processes while maintaining habitat components necessary for the conservation of lynx. **VEG O2.** Provide a mosaic of habitat conditions through time that support dense horizontal cover, and high densities of snowshoe hare. Provide winter snowshoe hare habitat in both the stand initiation structural stage and in mature, multi-story conifer vegetation.
3. If the landscape has been fragmented by past management activities that reduced the quality of lynx habitat, adjust management practices to produce forest composition, structure and patterns more similar to those that would have occurred under historical disturbance regimes.	**Vege O3.** Design vegetation management practices, to the extent practicable, to be consistent with historical succession and disturbance regimes, while maintaining all required habitat components in lynx habitat.	**VEG O1.** Manage vegetation to be more similar to historic succession and disturbance processes while maintaining habitat components necessary for the conservation of lynx.	**VEG O1.** Manage vegetation to mimic or approximate natural succession and disturbance processes while maintaining habitat components necessary for the conservation of lynx.
Project objectives for timber management			
1. Design regeneration harvest, planting, and thinning to develop characteristics suitable for lynx and snowshoe hare habitat.	**Vege O5.** Design regeneration harvest, planting, and thinning to maintain or enhance dense horizontal cover of conifers for snowshoe hare habitat. In aspen stands intermixed with spruce-fir forests, particularly in southern Idaho, southern Montana, Wyoming, and Utah, treatments should result in dense regeneration of aspen.	**VEG O4.** Design regeneration harvest, reforestation and thinning to develop characteristics suitable for winter snowshoe hare habitat.	**VEG O4.** Focus vegetation management in areas that have potential to improve winter snowshoe hare habitat but presently have poorly developed understories that lack dense horizontal cover.
2. Design projects to retain/enhance existing habitat condition for important alternative	**Vege O6.** Design vegetative management practices to develop characteristics suitable for lynx and	**VEG G5.** Habitat for alternate prey species, primarily red squirrel, should be provided in each LAU.	**VEG G5.** Habitat for alternate prey species, primarily red squirrel, should be provided in each LAU.

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prey (particularly red squirrel).	snowshoe hare habitat while also considering the habitat needs of important alternate prey, especially red squirrels.	*(Note: Habitat needs for red squirrel would be evaluated under VEG O1.)* **VEG O1.** Manage vegetation to be more similar to historic succession and disturbance processes while maintaining habitat components necessary for the conservation of lynx.	*(Note: Habitat needs for red squirrel would be evaluated under VEG O1.)* **VEG O1.** Manage vegetation to mimic or approximate natural succession and disturbance processes while maintaining habitat components necessary for the conservation of lynx.
Project standards for timber management			
1. Management actions (e.g., timber sales, salvage sales) shall not change more than 15 percent of lynx habitat within an LAU to unsuitable condition within a 10-year period.	**Vege S3.** Vegetative management practices shall not change more than 15 percent of lynx habitat within an LAU to an unsuitable condition within a 10-year period.	**VEG S2.** Timber management projects shall not change more than 15 percent of lynx habitat on NFS or BLM lands in an LAU to an unsuitable condition in a ten-year period.	**VEG S2. Where and how this Standard applies:** Standard VEG S2 applies to all timber management projects that regenerate forests, except for fuel treatment projects within the wildland urban interface (WUI) as defined by HFRA, subject to the following limitation: Fuel treatment projects within the WUI that do not meet Standards VEG S1, VEG S2, VEG S5, and VEG S6 may occur on no more that 6 percent (cumulatively) of the lynx habitat on each administrative unit (a unit is a National Forest). For fuel treatment projects within the WUI see guideline VEG G10. **The Standard:** Timber management projects shall not regenerate more than 15 percent of lynx habitat on NFS lands within an LAU in a ten-year period.
2. Following a disturbance such as blow down, fires, insects/pathogens mortality that could contribute to lynx denning habitat, do not salvage	**Vege S4.** In the event of a large wildfire, conduct a post-disturbance assessment before salvage harvest to evaluate potential for lynx denning	**VEG S4.** After a disturbance kills trees in areas five acres or smaller that could contribute to lynx denning habitat, salvage harvest may	**VEG G11.** Denning habitat should be distributed in each LAU in the form of pockets of large amounts of large woody debris, either down logs

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harvest when the affected area is smaller than 5 acres. Exceptions to this include: 1) Areas such as developed campgrounds; 2) LAUs where denning habitat has been mapped and field validated (not simply modeled or estimated), and denning habitat comprises more than 10% of lynx habitat within an LAU; in these cases, salvage harvest may occur, provided that at least the minimum amount is maintained in a well-distributed pattern (see glossary).	and foraging habitat. **Vege S5.** Following a disturbance, such as blow down, fires, insects/pathogens mortality that could contribute to lynx denning habitat, do not salvage harvest when the affected areas are smaller than 5 acres. Exceptions to this include (a) developed recreation sites or other areas of high human concentration; (b) in LAUs where denning habitat has been mapped and field validated, salvage harvest may occur, provided that a minimum of 10 percent of the area is retained and is well distributed within an LAU.	occur only: 1) In developed recreation sites, administrative sites, or authorized special use structures or improvements; or 2) In designated road or trail corridors where public safety or access has been or may be compromised; or 3) In LAUs where denning habitat has been mapped and field-validated, provided at least ten percent is retained and well distributed.	or root wads, or large piles of small wind thrown trees ("jack-strawed" piles). If denning habitat appears to be lacking in the LAU, then projects should be designed to retain some coarse woody debris, piles, or residual trees to provide denning habitat in the future.
3. In lynx habitat, pre-commercial thinning will be allowed only when stands no longer provide snowshoe hare habitat (e.g., self-pruning processes have eliminate snowshoe hare cover and forage availability during winter conditions with average snow pack).	**Vege S6.** In lynx habitat, pre-commercial thinning will be allowed only when stands no longer provide snowshoe hare habitat (e.g., self-pruning processes have eliminated snowshoe hare cover and forage availability during winter conditions with average snow pack).	**VEG S5**. Precommercial thinning projects that reduce winter snowshoe hare habitat during the stand initiation structural stage may occur only: 1) Within 200 feet of administrative sites, dwellings or outbuildings. **VEG S6.** Precommercial thinning projects that reduce winter snowshoe hare habitat during the understory-reinitiation or old-multistory structural stages may occur only: 1) Within 200 feet of administrative sites, dwellings or outbuildings.	**VEG S5. Where and how this Standard applies:** Standard VEG S5 applies to all precommercial thinning projects, except for fuel treatment projects that use precommercial thinning as a tool within the wildland urban interface (WUI) as defined by HFRA, subject to the following limitation: Fuel treatment projects within the WUI that do not meet Standards VEG S1, VEG S2, VEG S5, and VEG S6 may occur on no more that 6 percent (cumulatively) of the lynx habitat on each administrative unit (a unit is a National Forest). For fuel treatment projects within the WUI see guideline VEG G10. **The Standard:** Precommercial

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			thinning projects that reduce snowshoe hare habitat may occur from the stand initiation structural stage until the stands no longer provide winter snowshoe hare habitat only: 1. Within 200 feet of administrative sites, dwellings, or outbuildings; or 2. For research studies or genetic tree tests evaluating genetically improved reforestation stock; or 3. Based on new information that is peer reviewed and accepted by the regional level of the Forest Service, and the state level of the FWS, where a written determination states: (a) that a project is not likely to adversely affect lynx; or (b) that a project is likely to have short term adverse effects on lynx or its habitat, but would result in long-term benefits to lynx and its habitat; or 4. For conifer removal in aspen, or daylight thinning around individual aspen trees, where aspen is in decline; or 5. For daylight thinning of planted rust-resistant white pine where 80 % of the winter snowshoe hare habitat is retained; or 6. To restore whitebark pine.
4. In aspen stands within lynx habitat, in the Southern and Northern Rocky Mountains	**Vege S7.** In aspen stands within lynx habitat, harvest prescriptions must favor regeneration of aspen.	**VEG O4.** Design regeneration harvest, reforestation and thinning to develop characteristics suitable	**VEG O4.** Focus vegetation management in areas that have potential to improve winter

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Geographic Area, apply harvest prescriptions that favor regeneration of aspen.	Note: An aspen stand is a group of aspen occupying a specific area and sufficiently uniform in composition, age, spatial arrangement, and conditions as to be distinguishable from the vegetation on adjoining lands.	for winter snowshoe hare habitat. **VEG G1.** Vegetation management projects should be planned to recruit a high density of conifers, hardwoods and shrubs where such habitat is scarce or not available. Winter snowshoe hare habitat should be near denning habitat. Vegetation management projects should be planned to extend the production of winter snowshoe hare habitat when forage quality and quantity is declining. *Specific direction for aspen was not included because it is implied in VEG G1 and VEG O4. Regardless of what species is there, projects should be developed to provide winter snowshoe hare foraging habitat where it is lacking.*	snowshoe hare habitat but presently have poorly developed understories that lack dense horizontal cover. **VEG S5. Where and how this Standard applies:** Standard VEG S5 applies to all precommercial thinning projects, except for fuel treatment projects that use precommercial thinning as a tool within the wildland urban interface (WUI) as defined by HFRA, subject to the following limitation: Fuel treatment projects within the WUI that do not meet Standards VEG S1, VEG S2, VEG S5, and VEG S6 may occur on no more that 6 percent (cumulatively) of the lynx habitat on each administrative unit (a unit is a National Forest). For fuel treatment projects within the WUI see guideline VEG G10. **The Standard (in pertinent part reads):** Precommercial thinning projects that reduce snowshoe hare habitat may occur from the stand initiation structural stage until the stands no longer provide winter snowshoe hare habitat only: … 4. For conifer removal in aspen, or daylight thinning around individual aspen trees, where aspen is in decline;… **VEG G1.** Vegetation management projects should be planned to recruit a high density of conifers, hard-woods, and shrubs where such habi-

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			tat is scarce or not available. Priority for treatment should be given to stem-exclusion, closed-canopy structural stage stands to enhance habitat conditions for lynx or their prey (e.g. mesic, monotypic lodgepole stands). Winter snowshoe hare habitat should be near denning habitat.
Project guidelines for timber management			
1. Plan regeneration harvest in lynx habitat where little or no habitat for snowshoe hares is currently available, to recruit a high density of confers, hardwoods and shrubs preferred by hares. Consider the following: Design regeneration prescriptions to mimic historical fire (or other natural disturbance) events, including retention of fire-killed dead trees and coarse woody debris; Design harvest units to mimic the pattern and scale of natural disturbances and retain natural connectivity across the landscape. Evaluate the potential of riparian zones, ridges, and saddles to provide connectivity; and Provide for continuing availability of foraging habitat in proximity to denning habitat.	**Vege G1.** Plan regeneration harvests in lynx habitat where little or no habitat for snowshoe hares is currently available, to recruit a high density of conifers, hardwoods and shrubs preferred by hares. Consider the following: 1) Design regeneration prescriptions to mimic historical fire (or other natural disturbance) events, including retention of fire-killed dead trees and coarse woody debris; 2) Design harvest units to mimic the pattern and scale of natural disturbances and retain natural connectivity across the landscape. Evaluate the potential of riparian zones, ridges, and saddles to provide connectivity; and 3) Provide for continuing availability of foraging habitat in proximity to denning habitat.	**VEG G1.** Vegetation management projects should be planned to recruit a high density of conifers, hardwoods and shrubs where such habitat is scarce or not available. Winter snowshoe hare habitat should be near denning habitat. Vegetation management projects should be planned to extend the production of winter snowshoe hare habitat when forage quality and quantity is declining. **VEG G2.** Where more denning habitat is desired, leave standing trees and coarse woody debris in amounts similar to what would be there naturally. Denning habitat should be near winter snowshoe hare habitat. **ALL S1.** New or expanded permanent developments and vegetation management projects must maintain habitat connectivity. **VEG G4.** Fire use activities should not create permanent travel routes that facilitate snow compaction.	**VEG G1.** Vegetation management projects should be planned to recruit a high density of conifers, hard-woods, and shrubs where such habitat is scarce or not available. Priority for treatment should be given to stem-exclusion, closed-canopy structural stage stands to enhance habitat conditions for lynx or their prey (e.g. mesic, monotypic lodgepole stands). Winter snowshoe hare habitat should be near denning habitat. **VEG G11.** Denning habitat should be distributed in each LAU in the form of pockets of large amounts of large woody debris, either down logs or root wads, or large piles of small wind thrown trees ("jack-strawed" piles). If denning habitat appears to be lacking in the LAU, then projects should be designed to retain some coarse woody debris, piles, or residual trees to provide denning habitat in the future. **ALL S1.** New or expanded

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		Constructing permanent firebreaks on ridges or saddles should be avoided. **HU G7.** New permanent roads should not be built on ridge-tops and saddles, or in areas identified as important for lynx habitat connectivity. New permanent roads and trails should be situated away from forested stringers.	permanent developments and vegetation management projects must maintain habitat connectivity in an LAU and/or linkage area. **VEG G4.** Prescribed fire activities should not create permanent travel routes that facilitate snow compaction. Constructing permanent firebreaks on ridges or saddles should be avoided. **HU G7.** New permanent roads should not be built on ridge-tops and saddles, or in areas identified as important for lynx habitat connectivity. New permanent roads and trails should be situated away from forested stringers.
2. In areas where recruitment of additional denning habitat is desired, or to extend the production of snowshoe hare foraging habitat where forage quality and quantity is declining due to plant succession, consider improvement harvests (commercial thinning, selection, etc). Improvement harvests should be designed to: Retain and recruit understories of small diameter conifers and shrubs preferred by hares: Retain and recruit coarse woody debris, consistent with the likely availability of such material under natural disturbance regimes: and Maintain or improve juxtaposition of denning and foraging habitat	**Vege G2.** In areas where recruitment of additional denning habitat is desired, or to extend the production of snowshoe hare foraging habitat where forage quality and quantity is declining due to plant succession, consider improvement harvests (commercial thinning, selection, etc). Improvement harvests should be designed to: 4) Retain and recruit the understory of small diameter conifers and shrubs preferred by hares; 5) Retain and recruit coarse woody debris, consistent with the likely availability of such material under natural disturbance regimes; and	**VEG G1.** Vegetation management projects should be planned to recruit a high density of conifers, hardwoods and shrubs where such habitat is scarce or not available. Winter snowshoe hare habitat should be near denning habitat. Vegetation management projects should be planned to extend the production of winter snowshoe hare habitat when forage quality and quantity is declining. **VEG G2.** Where more denning habitat is desired, leave standing trees and coarse woody debris in amounts similar to what would be there naturally. Denning habitat should be near winter snowshoe hare habitat.	**VEG G1.** Vegetation management projects should be planned to recruit a high density of conifers, hardwoods, and shrubs where such habitat is scarce or not available. Priority for treatment should be given to stem-exclusion, closed-canopy structural stage stands to enhance habitat conditions for lynx or their prey (e.g. mesic, monotypic lodgepole stands). **VEG G11.** Denning habitat should be distributed in each LAU in the form of pockets of large amounts of large woody debris, either down logs or root wads, or large piles of small wind thrown trees ("jack-strawed" piles). If denning habitat appears to be lacking in the LAU, then projects

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	6) Maintain or improve the juxtaposition of denning and foraging habitat.	**VEG G3.** Vegetation management projects designed to retain or restore denning habitat should be located where there is a low probability of stand-replacing fire. *(NOTE: Alternative B placed forage and denning habitat direction into separate guidelines, instead of blending them together.)*	should be designed to retain some coarse woody debris, piles, or residual trees to provide denning habitat in the future.
Wildland fire management			
Programmatic objectives for wildland fire management			
1. Restore fire as an ecological process. Evaluate whether fire suppression, forest type conversion, and other forest management practices have altered fire regimes and the function of ecosystems	**Vege O2.** Restore fire as an ecological process, and use fire as a tool to maintain or restore lynx habitat where appropriate.	**VEG O3.** Conduct fire use activities to restore ecological processes and maintain or improve lynx habitat.	**VEG O3.** Conduct fire use activities to restore ecological processes and maintain or improve lynx habitat.
2. Revise or develop fire management plans to integrate lynx habitat management objectives. Prepare plans for areas large enough to encompass large historical fire events.	Not included. *Forest Service Manual 5141.1 (June 1999) describes the requirements for considering fire use plans, in the forest planning process; therefore, it is already a requirement under existing policies.*	Not included. *Forest Service Manual 5141.11 (June 1999) describes the requirements for considering fire use plans, in the forest planning process; therefore, it is already a requirement under existing policies.*	Not included. *Forest Service Manual 5141.11 (June 1999) describes the requirements for considering fire use plans, in the forest planning process; therefore, it is already a requirement under existing policies.*
3. Use fire to move toward landscape patterns consistent with native succession and disturbance regimes. Consider use of mechanical pre-treatment and management ignitions if needed to restore fire as an ecological process.	**Vege O2.** Restore fire as an ecological process, and use fire as a tool to maintain or restore lynx habitat, where appropriate.	**VEG O1.** Manage vegetation to be more similar to historic succession and disturbance processes while maintaining habitat components necessary for the conservation of lynx. **VEG O3.** Conduct fire use activities to restore ecological processes and maintain or improve lynx habitat.	**VEG O1.** Manage vegetation to mimic or approximate natural succession and disturbance processes while maintaining habitat components necessary for the conservation of lynx. **VEG O3.** Conduct fire use activities to restore ecological processes and maintain or improve lynx habitat.
4. Adjust management practices where needed to produce forest composition, structure, and patterns	**Vege O3.** Design vegetation management practices, to the extent practicable, to be consistent with	**VEG O1.** Manage vegetation more similar to historic succession and disturbance processes while	**VEG O1.** Manage vegetation to mimic or approximate natural succession and disturbance

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more similar to those that would have occurred under historical succession and disturbance regimes.	historical succession and disturbance regimes, while maintaining all required habitat components in lynx habitat.	maintaining habitat components necessary for the conservation of lynx. **VEG G3.** Vegetation management projects designed to retain or restore denning habitat should be located where there is a low probability of stand-replacing fire.	processes while maintaining habitat components necessary for the conservation of lynx. **VEG G11.** Denning habitat should be distributed in each LAU in the form of pockets of large amounts of large woody debris, either down logs or root wads, or large piles of small wind thrown trees ("jack-strawed" piles). If denning habitat appears to be lacking in the LAU, then projects should be designed to retain some coarse woody debris, piles, or residual trees to provide denning habitat in the future.
5. Design vegetation and fire management activities to retain or restore denning habitat on landscapes with the highest probability of escaping stand-replacing fire events. Evaluate current distribution, amount, and arrangement of lynx habitat in relation to fire disturbance patterns.	**Vege O4.** Design vegetation and fire management activities to retain or restore denning habitat on landscape with the lowest probability of stand replacing fire events. **Vege O3.** Design vegetation management practices, to the extent practicable, to be consistent with historical succession and disturbance regimes, while maintaining all required habitat components in lynx habitat.	**VEG O1.** Manage vegetation to be more similar to historic succession and disturbance processes while maintaining habitat components necessary for the conservation of lynx. **VEG G3.** Vegetation management projects designed to retain or restore denning habitat should be located where there is a low probability of stand-replacing fire.	**VEG O1.** Manage vegetation to mimic or approximate natural succession and disturbance processes while maintaining habitat components necessary for the conservation of lynx. **VEG G11.** Denning habitat should be distributed in each LAU in the form of pockets of large amounts of large woody debris, either down logs or root wads, or large piles of small wind thrown trees ("jack-strawed" piles). If denning habitat appears to be lacking in the LAU, then projects should be designed to retain some coarse woody debris, piles, or residual trees to provide denning habitat in the future.
Project objectives for wildland fire management			
1. Use fire as a tool to maintain or restore lynx habitat.	**Vege O2.** Restore fire as an ecological process, and use fire as a	**VEG O3.** Conduct fire use activities to restore ecological	**VEG O3.** Conduct fire use activities to restore ecological

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	tool to maintain or restore lynx habitat, where appropriate.	processes and maintain or improve lynx habitat.	processes and maintain or improve lynx habitat.
2. When managing wildland fire, minimize creation of permanent travel ways that could facilitate increased access by competitors.	**Vege O7.** When managing wildland fire, minimize creation of permanent travel ways that could facilitate increased access by competitors.	**VEG G4.** Fire use activities should not create permanent travel routes that facilitate snow-compaction. Constructing permanent firebreaks on ridges or saddles should be avoided.	**VEG G4.** Prescribed fire activities should not create permanent travel routes that facilitate snow compaction. Constructing permanent firebreaks on ridges or saddles should be avoided.
Project standards for wildland fire management			
1. In the event of a large wildfire, conduct a post-disturbance assessment before salvage harvest, particularly in stands that were formerly in late successional stages, to evaluate potential for lynx denning and foraging habitat.	**Vege S4.** In the event of a large wildfire, conduct a post-disturbance assessment before salvage harvest to evaluate potential for lynx denning and foraging habitat.	Not included. *If a project to salvage harvest in lynx habitat was proposed, then the NEPA document would describe the existing condition and effects on lynx habitat. Standards VEG S1 through S4 would apply.*	Not included. *If a project to salvage harvest in lynx habitat was proposed, then the NEPA document would describe the existing condition and effects on lynx habitat. Standards VEG S1 and S2, and Guideline VEG G11 would apply.*
2. Design burn prescriptions to regenerate or create snowshoe hare habitat (e, g., regeneration of aspen and lodgepole pine).	**Vege S8.** Burn prescriptions in aspen and lodgepole pine stands will be designed to regenerate or create snowshoe hare habitat.	**VEG O3.** Conduct fire use activities to restore ecological processes and maintain or improve lynx habitat. **VEG G1.** Vegetation management projects should be planned to recruit a high density of conifers, hardwoods and shrubs where such habitat is scarce or not available. Winter snowshoe hare habitat should be near denning habitat. Vegetation management projects should be planned to extend the production of winter snowshoe hare habitat when forage quality and quantity is declining.	**VEG O3.** Conduct fire use activities to restore ecological processes and maintain or improve lynx habitat. **VEG G1.** Vegetation management projects should be planned to recruit a high density of conifers, hard-woods, and shrubs where such habitat is scarce or not available. Priority for treatment should be given to stem-exclusion, closed-canopy structural stage stands to enhance habitat conditions for lynx or their prey (e.g. mesic, monotypic lodgepole stands).
Project guidelines for wildland fire management			
1. Design burn prescriptions to promote response by shrub and tree species that are favored by snowshoe hare.	Not included. *Already an objective Vege O6 and standard Vege S8.* **Vege O6.** Design vegetative	**VEG G1.** Vegetation management projects should be planned to recruit a high density of conifers, hardwoods and shrubs where such	**VEG G1.** Vegetation management projects should be planned to recruit a high density of conifers, hard-woods, and shrubs where such

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	management practices to develop characteristics suitable for lynx and snowshoe hare habitat while also considering the habitat needs of important alternate prey, especially red squirrels. **Vege S8.** Burn prescriptions in aspen and lodgepole pine stands will be designed to regenerate or create snowshoe hare habitat	habitat is scarce or not available. Winter snowshoe hare habitat should be near denning habitat. Vegetation management projects should be planned to extend the production of winter snowshoe hare habitat when forage quality and quantity is declining.	habitat is scarce or not available. Priority for treatment should be given to stem-exclusion, closed-canopy structural stage stands to enhance habitat conditions for lynx or their prey (e.g. mesic, monotypic lodgepole stands).
2. Design burn prescriptions to retain or encourage tree species composition and structure that will provide habitat for red squirrels or other alternate prey species.	Not included. *Already part of Objective Vege 06* **Vege O6.** Design vegetative management practices to develop characteristics suitable for lynx and snowshoe hare habitat while also considering the habitat needs of important alternate prey, especially red squirrels.	**VEG G5.** Habitat for alternate prey species, primarily red squirrel, should be provided in each LAU.	**VEG G5.** Habitat for alternate prey species, primarily red squirrel, should be provided in each LAU.
3. Consider the need for pre-treatment of fuels before conducting management ignitions.	**Vege G3.** Consider the need for pre-treatment of fuels before conducting management ignitions.	Not included. *Standard procedures.*	Not included. *Standard procedures.*
4. Avoid construction of permanent firebreaks on ridges or saddles in lynx habitat.	**Vege G4.** Avoid construction permanent firebreaks on ridges or saddles in lynx habitat.	**VEG G4.** Fire use activities should not create permanent travel routes that facilitate snow compaction. Constructing permanent firebreaks on ridges or saddles should be avoided.	**VEG G4.** Prescribed fire activities should not create permanent travel routes that facilitate snow compaction. Constructing permanent firebreaks on ridges or saddles should be avoided.
5. Minimize construction of temporary roads and machine fire lines to the extent possible during fire suppression activities.	Not included. *Already an objective – Vege 07* **Vege O7.** When managing wildland fire, minimize creation of permanent travel ways that could facilitate increased access by competitors.	**VEG G4.** Fire use activities should not create permanent travel routes that facilitate snow-compaction. Constructing permanent firebreaks on ridges or saddles should be avoided.	**VEG G4.** Prescribed fire activities should not create permanent travel routes that facilitate snow compaction. Constructing permanent firebreaks on ridges or saddles should be avoided.

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6. Design burn prescriptions and, where feasible, conduct fire suppression action in a manner that maintains adequate lynx denning habitat (10% of lynx habitat per LAU).	**Vege G5.** Design burn prescriptions and, where feasible, conduct fire suppression action in a manner that maintains adequate lynx denning habitat (10% of lynx habitat per LAU).	**VEG S3.** Maintain at least ten percent of the lynx habitat in an LAU as denning habitat in patches generally larger than five acres. Where less than ten percent denning habitat is present in an LAU, defer vegetation management projects in stands that have the highest potential to develop denning habitat.	**VEG G11.** Denning habitat should be distributed in each LAU in the form of pockets of large amounts of large woody debris, either down logs or root wads, or large piles of small wind thrown trees ("jack-strawed" piles). If denning habitat appears to be lacking in the LAU, then projects should be designed to retain some coarse woody debris, piles, or residual trees to provide denning habitat in the future.
Recreation management			
Programmatic objectives for recreation management			
1. Plan for and manage recreational activities to protect the integrity of lynx habitat, considering as a minimum the following: Minimize snow compaction in lynx habitat. Concentrate recreational activities within existing developed areas, rather than developing new recreational areas in lynx habitat On federal lands, ensure that development or expansion of developed recreation sites or ski areas and adjacent lands address landscape connectivity and lynx habitat needs.	**HUD O1.** Maintain the natural competitive advantage of lynx in deep snow conditions. Minimize snow compaction in lynx habitat. **HUD O2.** Concentrate activities within existing developed areas, rather than developing new areas in lynx habitat. **HUD O3.** On National Forest lands, ensure that development or expansion of developed recreation sites or ski areas and adjacent lands provides for landscape connectivity and lynx habitat needs.	**HU O1.** Maintain the lynx's natural competitive advantage over other predators in deep snow by discouraging the expansion of snow-compacting activities in lynx habitat. **HU O2.** Manage recreational activities to maintain lynx habitat and connectivity. **HU O3.** Concentrate activities in existing developed areas, rather than developing new areas in lynx habitat. **HU O4.** Provide for lynx habitat needs and connectivity, when developing new or expanding existing developed recreation sites or ski areas.	**HU O1.** Maintain the lynx's natural competitive advantage over other predators in deep snow by discouraging the expansion of snow-compacting activities in lynx habitat. **HU O2.** Manage recreational activities to maintain lynx habitat and connectivity. **HU O3.** Concentrate activities in existing developed areas, rather than developing new areas in lynx habitat. **HU O4.** Provide for lynx habitat needs and connectivity, when developing new or expanding existing developed recreation sites or ski areas.
Programmatic standards for recreation management			
1. On federal lands in lynx habitat, allow no net increase in groomed or designated over-the-snow routes and snowmobile play areas by LAU	**Dispersed Rec S1.** On National Forest and BLM lands in lynx habitat, allow no net increase in groomed or designated over-the-snow routes and designated snowmobile play	**HU S1.** Allow no net increase in groomed or designated over-the-snow routes or play areas by LAU, unless the grooming or designation serves to consolidate use and	**HU G11.** Designated over-the-snow routes or designated play areas should not expand outside baseline areas of consistent snow compaction, unless designation serves to

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[1]*unless the designation serves to consolidate unregulated use and improves lynx habitat.* ~~This is intended to apply to dispersed recreation, rather than existing~~ NOTE: *This standard does not apply* to ski areas.	areas by LAU, unless the grooming or designation serves to consolidate use and improve lynx habitat. This does not apply to permitted ski areas, winter logging or trail re-routes necessary for public safety.	improve lynx habitat. This does not apply inside permitted ski area boundaries, to winter logging, to rerouting trails for public safety, to accessing private inholdings, or to other access regulated by HU S3.	consolidate use and improve lynx habitat. This may be calculated on an LAU basis, or on a combination of immediately adjacent LAUs. This does not apply inside permitted ski area boundaries, to winter logging, to rerouting trails for public safety, to accessing private inholding, or to access regulated by HU G12. Use the same analysis boundaries for all actions subject to this guideline.
2. Map and monitor the location and intensity of snow compacting activities (for example, snowmobiling, snow shoeing, cross-country skiing, dog sledding, etc.) that coincide with lynx habitat, to facilitate future evaluation of effects on lynx as information become available.	**Monitoring Item 1.** Map and monitor the location and intensity of snow compacting activities (for example, snowmobiling, snow shoeing, cross-country skiing, dog sledding, etc.) that coincide with lynx habitat, to facilitate future evaluation of effects on lynx as information become available.	**Monitoring.** Map the location and amount of snow-compacting use that coincided with lynx habitat in LAUs during the 1998-2000 seasons, for designated over-the-snow and groomed routes and areas, and routes of consistent snow compaction. Such activities include snowmobiling, snowshoeing, cross-country skiing, dog sledding, etc.	**Monitoring.** Map the location and intensity of snow compacting activities and designated and groomed routes that occurred inside LAUs during the period of 1998 to 2000. The mapping is to be completed within one year of this decision, and changes in activities and routes are to be monitored every five years after the decision.
Programmatic guidelines for recreation management			
1. Provide a landscape with interconnected blocks of foraging habitat where snowmobile, cross-country skiing, snow-shoeing, or other snow compacting activities are minimized or discouraged.	**HUD O2.** Concentrate activities within existing developed areas, rather than developing new areas in lynx habitat. **Dispersed Rec S1.** On National Forest and BLM lands in lynx habitat, allow no net increase in groomed or designated over-the-snow routes and designated snowmobile play areas by LAU, unless the grooming or designation serves to consolidate use and improve lynx habitat. This	**ALL S1.** New or expanded permanent developments and vegetation management projects must maintain habitat connectivity. **HU S1.** Allow no net increase in groomed or designated over-the-snow routes or play areas by LAU, unless the grooming or designation serves to consolidate use and improve lynx habitat. This does not apply inside permitted ski area boundaries, to winter	**ALL S1.** New or expanded permanent developments and vegetation management projects must maintain habitat connectivity in an LAU and/or linkage area. **HU G11.** Designated over-the-snow routes or designated play areas should not expand outside baseline areas of consistent snow compaction, unless designation serves to consolidate use and improve lynx habitat. This may be calculated on

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	does not apply to permitted ski areas, winter logging or trail re-routes necessary for public safety. *Incorporation of the objectives and standards should result in meeting this guideline; therefore it is not specifically included.*	logging, to rerouting trails for public safety, to accessing private inholdings, or to other access regulated by HU S3. *Incorporating the objectives and standards should result in meeting this guideline; therefore, it is not specifically included.*	an LAU basis, or on a combination of immediately adjacent LAUs. This does not apply inside permitted ski area boundaries, to winter logging, to rerouting trails for public safety, to accessing private inholdings, or to access regulated by HU G12. Use the same analysis boundaries for all actions subject to this guideline.
2. As information becomes available on the impacts of snow-compacting activities and disturbance on lynx, limit or discourage activities that result in snow compaction in areas where it is shown to compromise lynx habitat. Such actions should be undertaken on a priority basis considering habitat function and importance.	Not included. *It is an existing requirement under NEPA to review and utilize, as appropriate, any new information. New information may result in a need to amend existing management direction and special use permits.*	Not included. *It is an existing requirement to review and utilize, as appropriate, any new information. New information may result in a need to amend existing management direction.*	Not included. *It is an existing requirement to review and utilize, as appropriate, any new information. New information may result in a need to amend existing management direction.*
Project standards – Developed recreation			
1. In lynx habitat, ensure that federal actions do not degrade or compromise landscape connectivity when planning and operation new or expanded recreation developments.	**Dev Rec S2.** In lynx habitat, ensure that federal actions do not degrade or compromise landscape connectivity when planning and operation new or expanded recreation developments.	**ALL S1.** New or expanded permanent developments and vegetation management projects must maintain habitat connectivity.	**ALL S1.** New or expanded permanent developments and vegetation management projects must maintain habitat connectivity in an LAU and/or linkage area.
2. Design trails, roads, and lift termini to direct winter use away from diurnal security habitat.	**Developed Rec S1.** Design trails, roads, and lift termini to direct winter use away from diurnal security habitat. This standard only applies to developed ski areas.	**HU S2.** When developing or expanding ski areas, locate trails, access roads and lift termini to maintain and provide lynx diurnal security habitat if it's been identified as a need.	**HU G10.** When developing or expanding ski areas and trails, consider locating access roads and lift termini to maintain and provide lynx security habitat if it has been identified as a need.
Project standards – Dispersed recreation			
1. To protect the integrity of lynx habitat, evaluate (as new information becomes available) and amend as	**Dispersed Rec S2.** To protect the integrity of lynx habitat, evaluate (as new information becomes available)	Not included. *It is an existing requirement to review and utilize, as appropriate, any new*	Not included. *It is an existing requirement to review and utilize, as appropriate, any new*

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needed, winter recreational special use permits (outside of permitted ski areas) that promote snow compacting activities in lynx habitat.	and amend as needed, winter recreational special use permits (outside of permitted ski areas) that promote snow compacting activities in lynx habitat.	*information. New information may result in a need to amend existing management direction and special use permits.*	*information. New information may result in a need to amend existing management direction and special use permits.*
Project guidelines – Developed recreation			
1. Identify and protect potential security habitats in around proposed developments or expansions.	**Developed Rec G1.** Identify and protect potential security habitats in around proposed developments or expansions.	**HU S2**. When developing or expanding ski areas, locate trails, access roads and lift termini to maintain and provide lynx diurnal security habitat if it's been identified as a need. **HU G1.** When developing or expanding ski areas, provisions should be made for adequately sized inter-trail islands that include coarse woody debris, so winter snowshoe hare habitat is maintained. **HU G3.** Recreation developments and operations should be planned in ways that both provide for lynx movement and maintain the effectiveness of lynx habitat.	**HU G10.** When developing or expanding ski areas and trails, consider locating access roads and lift termini to maintain and provide lynx security habitat if it has been identified as a need. **HU G1.** When developing or expanding ski areas, provisions should be made for adequately sized inter-trail islands that include coarse woody debris, so winter snowshoe hare habitat is maintained. **HU G3.** Recreation developments and operations should be planned in ways that both provide for lynx movement and maintain the effectiveness of lynx habitat.
2. When designing ski area expansions, provide adequately sized coniferous inter-trail islands, including the retention of coarse woody material, to maintain snowshoe hare habitat.	**Developed Rec G2.** When designing ski area expansions, provide adequately sized coniferous inter-trail islands, including the retention of coarse woody material, to maintain snowshoe hare habitat.	**HU G1.** When developing or expanding ski areas, provisions should be made for adequately sized inter-trail islands that include coarse woody debris, so winter snowshoe hare habitat is maintained.	**HU G1.** When developing or expanding ski areas, provisions should be made for adequately sized inter-trail islands that include coarse woody debris, so winter snowshoe hare habitat is maintained.
3. Evaluate, and adjust as necessary, ski operations in expanded or newly developed areas to provide nocturnal foraging opportunities for lynx in a manner consistent with operational needs, especially in	**Developed Rec G3.** Evaluate, and adjust as necessary, ski operations in expanded or newly developed areas to provide nocturnal foraging opportunities for lynx in a manner consistent with operational needs,	**HU G2.** When developing or expanding ski areas, nocturnal foraging opportunities should be provided consistent with the ski area's operational needs, especially where lynx habitat occurs as narrow	**HU G2.** When developing or expanding ski areas, lynx foraging habitat should be provided consistent with the ski area's operational needs, especially where lynx habitat occurs as narrow bands

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landscapes where lynx habitat occurs as narrow bands of coniferous forest across the mountain slopes.	especially in landscapes where lynx habitat occurs as narrow bands of coniferous forest across the mountain slopes.	bands of coniferous forest across mountain slopes.	of coniferous forest across mountain slopes.
Forest backcountry roads & trails			
Programmatic objectives for backcountry roads & trails			
1. Maintain the natural competitive advantage of lynx in deep snow conditions.	**HUD O1.** Maintain the natural competitive advantage of lynx in deep snow conditions.	**HU O1.** Maintain the lynx's natural competitive advantage over other predators in deep snow, by discouraging the expansion of snow-compacting activities in lynx habitat.	**HU O1.** Maintain the lynx's natural competitive advantage over other predators in deep snow, by discouraging the expansion of snow-compacting activities in lynx habitat.
Programmatic standards for backcountry roads & trails			
1. On federal lands in lynx habitat, allow no net increase in groomed or designated over-the-snow routes and snowmobile play areas by LAU[1] *unless the designation serves to consolidate unregulated use and improves lynx habitat*. Winter logging activity is not subject to this restriction.	**Dispersed Rec S1**. On National Forest and BLM lands in lynx habitat, allow no net increase in groomed or designated over-the-snow routes and designated snowmobile play areas by LAU, unless the grooming or designation serves to consolidate use and improve lynx habitat. This does not apply to permitted ski areas, winter logging or trail re-routes necessary for public safety.	**HU S1.** Allow no net increase in groomed or designated over-the-snow routes or play areas by LAU, unless the grooming or designation serves to consolidate use and improve lynx habitat. This does not apply inside permitted ski area boundaries, to winter logging, to rerouting trails for public safety, to accessing private inholdings, or to other access regulated by HU S3.	**HU G11.** Designated over-the-snow routes or designated play areas should not expand outside baseline areas of consistent snow compaction, unless designation serves to consolidate use and improve lynx habitat. This may be calculated on an LAU basis, or on a combination of immediately adjacent LAUs. This does not apply inside permitted ski area boundaries, to winter logging, to rerouting trails for public safety, to accessing private inholdings, or to access regulated by Guideline HU G12. Use the same analysis boundaries for all actions subject to this guideline.
Programmatic guidelines for backcountry roads & trails			
1. Determine where high total road densities (greater than 2 miles per square mile) coincide with lynx	**Highway G7**. Determine where high total road densities (greater than 2 miles per square mile)	Not included. *It is a requirement to evaluate the road system. 36 CFR 212.5(b)(2) requires*	Not included. *It is a requirement to evaluate the road system. 36 CFR 212.5(b)(2) requires*

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habitat, and prioritize roads for seasonal restrictions or reclamation in those areas.	coincide with lynx habitat, and prioritize roads for seasonal restrictions or reclamation in those areas.	*that the "Responsible officials must review the road system on each National Forest and Grassland and identify the roads on lands under Forest Service jurisdiction that are no longer needed to meet resource objectives, and that, therefore should be decommissioned or considered for other uses, such as for trails".*	*that the "Responsible Officials must review the road system on each National Forest and Grassland and identify the roads on lands under Forest Service jurisdiction that are no longer needed to meet resource objectives, and that, therefore should be decommissioned or considered for other uses, such as for trails".*
2. Minimize roadside brushing in order to provide snowshoe hare habitat.	**Highway G4**. Conduct roadside brushing on low-speed and low-volume roads at the minimum level necessary to provide for public safety.	**HU G8.** Cutting brush along low-speed, low-traffic-volume roads should be done to the minimum level necessary to provide for public safety.	**HU G8.** Cutting brush along low-speed, low-traffic-volume roads should be done to the minimum level necessary to provide for public safety.
3. Locate trails and roads away from forested stringers.	**Highway G5.** Locate trails and roads away from forested stringers.	**HU G7.** New permanent roads should not be built on ridge-tops and saddles, or in areas identified as important for lynx habitat connectivity. New permanent roads and trails should be situated away from forested stringers.	**HU G7.** New permanent roads should not be built on ridge-tops and saddles, or in areas identified as important for lynx habitat connectivity. New permanent roads and trails should be situated away from forested stringers.
4. Limit public use on temporary roads constructed for timber sales. Design new roads, especially the entrance, for effective closure upon completion of sale activities.	**Highway G6.** New roads constructed for project specific activities in lynx habitat, such as timber sales and mineral exploration, should be closed to public use. Provide for the ability to implement an effective closure in the initial design of the road. Upon project completion reclaim or obliterate these roads if not needed for other management objectives.	**HU G9.** On new roads built for projects, public motorized use should be restricted. Effective closures should be provided in road designs. When the project is over, these roads should be reclaimed or decommissioned, if not needed for other management objectives.	**HU G9.** On new roads built for projects, public motorized use should be restricted. Effective closures should be provided in road designs. When the project is over, these roads should be reclaimed or decommissioned, if not needed for other management objectives.
5. Minimize building of roads directly on ridge-tops or areas identified as important for lynx	**Highway G2.** Minimize building of roads directly on ridge-tops or areas identified as important for lynx	**HU G7**. New permanent roads should not be built on ridge-tops and saddles or in areas identified as	**HU G7**. New permanent roads should not be built on ridge-tops and saddles or in areas identified as

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habitat connectivity.	habitat connectivity.	important for lynx habitat connectivity. New permanent roads and trails should be situated away from forested stringers.	important for lynx habitat connectivity. New permanent roads and trails should be situated away from forested stringers.
Livestock grazing			
Programmatic objectives for livestock grazing			
1. In lynx habitat and adjacent shrub-steppe habitats, manage grazing to maintain the composition and structure of native plant communities.	**Grazing O2**. In lynx habitat and adjacent shrub-steppe habitats, manage grazing to maintain the composition and structure of native plant communities.	**GRAZ O1.** Manage livestock grazing to be compatible with improving or maintaining lynx habitat.	**GRAZ O1.** Manage livestock grazing to be compatible with improving or maintaining lynx habitat.
Project objectives for livestock grazing			
1. Manage livestock grazing within riparian areas and willow carrs in lynx habitat to provide conditions for lynx and lynx prey.	**Grazing O1.** Within lynx habitat, manage livestock grazing in riparian areas and willow carrs to maintain and achieve mid seral or higher condition to provide cover and forage for lynx and prey species.	**GRAZ O1.** Manage livestock grazing to be compatible with improving or maintaining lynx habitat.	**GRAZ O1.** Manage livestock grazing to be compatible with improving or maintaining lynx habitat.
2. Maintain or move towards native composition and structure of herbaceous and shrub plant communities.	**Vege O3.** Design vegetation management practices, to the extent practicable, to be consistent with historical succession and disturbance regimes, while maintaining all required habitat components in lynx habitat.	**GRAZ O1.** Manage livestock grazing to be compatible with improving or maintaining lynx habitat.	**GRAZ O1.** Manage livestock grazing to be compatible with improving or maintaining lynx habitat.
3. Ensure that ungulate grazing does not impede the development of snowshoe hare habitat in natural or created openings within lynx habitat.	Not included. *Duplicates Grazing S1* **Grazing S1.** Do not allow livestock use in openings created by fire or timber harvest that would delay successful regeneration of the shrub and tree components.	**GRAZ O1.** Manage livestock grazing to be compatible with improving or maintaining lynx habitat.	**GRAZ O1.** Manage livestock grazing to be compatible with improving or maintaining lynx habitat.
Project standards for livestock grazing			
1. Do not allow livestock use in openings created by fire or timber harvest that would delay successful	**Grazing S1.** Do not allow livestock use in openings created by fire or timber harvest that would	**GRAZ S1.** In fire- and harvest-created openings, manage livestock grazing to ensure impacts do not	**GRAZ G1.** In fire- and harvest-created openings, livestock grazing should be managed so impacts do

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regeneration of the shrub and tree components. [2] ~~Delay livestock use in post-fire and post-harvest created openings until successful regeneration of the shrub and tree components occurs.~~	delay successful regeneration of the shrub and tree components.	prevent successful regeneration of shrubs and trees.	not prevent shrubs and trees from regenerating.
2. Manage grazing in aspen stands to ensure sprouting and sprout survival sufficient to perpetuate the long-term viability of the clones.	**Grazing S2**. Manage grazing in aspen stands to ensure sprouting and sprout survival sufficient to perpetuate the long-term viability of the clones.	**GRAZ S2.** In aspen stands, manage livestock grazing to contribute to their long-term health and sustainability.	**GRAZ G2.** In aspen stands, livestock grazing should be managed to contribute to the long-term health and sustainability of aspen.
3. Within the elevational ranges that encompass forested lynx habitat, shrub-steppe habitats should be considered as integral to the lynx habitat matrix and should be managed to maintain or achieve mid-seral or higher condition.	**Grazing S3.** Shrub-steppe habitats interspersed with or immediately adjacent to lynx habitat are integral to the lynx habitat and must be managed to maintain or achieve mid seral or higher condition.	**GRAZ S4.** In shrub-steppe habitats, manage livestock grazing in the elevation ranges of forested lynx habitat in LAUs, to contribute to maintaining or achieving a preponderance of mid- or late-seral stages, similar to conditions that would have occurred under historic disturbance regimes. **LINK G2.** Livestock grazing in shrub-steppe habitats should be managed to contribute to maintaining or achieving a preponderance of mid- or late-seral stages, similar to conditions that would have occurred under historic disturbance regimes.	**GRAZ G4.** In shrub-steppe habitats, livestock grazing should be managed in the elevation ranges of forested lynx habitat in LAUs, to contribute to maintaining or achieving a preponderance of mid- or late-seral stages, similar to conditions that would have occurred under historic disturbance regimes. **LINK G2.** Livestock grazing in shrub-steppe habitats should be managed to contribute to maintaining or achieving a preponderance of mid- or late-seral stages, similar to conditions that would have occurred under historic disturbance regimes.
4. Within lynx habitat, mange livestock grazing in riparian areas and willow carrs to maintain or achieve mid-seral or later condition to provide cover and forage for lynx prey species.	**Grazing O1.** Within lynx habitat, manage livestock grazing in riparian areas and willow carrs to maintain and achieve mid seral or higher condition to provide cover and forage for lynx and prey species.	**GRAZ S3.** In riparian areas, and willow carrs, manage livestock grazing to contribute to maintaining or achieving a preponderance of mid- or late-seral stages, similar to conditions that would have occurred under historic disturbance regimes.	**GRAZ G3.** In riparian areas and willow carrs, livestock grazing should be managed to contribute to maintaining or achieving a preponderance of mid- or late-seral stages, similar to conditions that would have occurred under historic disturbance regimes.

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Other human developments: Oil & gas leasing, mines, reservoirs & agriculture			
Programmatic objectives for other human developments			
1. Design developments to minimize impacts on lynx habitat.	**HUD O4**. Manage human activities such as special uses, oil and gas leasing, mining and utility transmission corridors to minimize impacts to lynx and lynx habitat.	**HU O3**. Concentrate activities in existing developed areas, rather than developing new areas in lynx habitat. **HU O5.** Manage human activities – such as exploring and developing minerals and oil and gas, placing utility corridors and permitting special uses – to reduce impacts on lynx and lynx habitat.	**HU O3**. Concentrate activities in existing developed areas, rather than developing new areas in lynx habitat. **HU O5.** Manage human activities, such as special uses, mineral and oil and gas exploration and development, and placement of utility transmission corridors, to reduce impacts on lynx and lynx habitat.
Programmatic guidelines for other human developments			
1. Map oil and gas production and transmission facilities, mining activities and facilities, dams, and agricultural lands on public lands and adjacent private lands, in order to address cumulative effects.	Not included. *Mapping and cumulative effects are addressed through NEPA analysis requirements, where applicable.*	Not included. *Mapping and cumulative effects are addressed through NEPA analysis requirements, where applicable.*	Not included. *Mapping and cumulative effects are addressed through NEPA analysis requirements, where applicable.*
Project standards for other human developments			
1. On projects where over-snow access is required, restrict use to designated routes.	**Other DevelopS1.** On projects where over-snow access is required, restrict use to designated routes.	**HU S3.** Winter access for non-recreation special uses and mineral and energy exploration and development, shall be limited to designated routes or designated over-the-snow routes.	**HU G12.** Winter access for non-recreation special uses and mineral and energy exploration and development, should be limited to designated routes or designated over-the-snow routes.
Project guidelines for other human developments			
1. If activities are proposed in lynx habitat, develop stipulations for limitations on the timing of activities and surface use and occupancy at the leasing stage.	**Other human uses G1.** If activities are proposed in lynx habitat, develop stipulations for limitations on the timing of activities and surface use and occupancy at the leasing stage.	Not specifically included. *The objectives, standards, and guidelines would become part of plans. As such, the direction can be applied to projects at the permit to drill stage.*	Not specifically included. *The objectives, standards, and guidelines would become part of plans. As such, the direction can be applied to projects at the permit to drill stage.*
2. Minimize snow compaction when authorizing and monitoring developments. Encourage remote	**Other human uses G2.** Minimize snow compaction when authorizing and monitoring developments. En-	**HU G4.** For mineral and energy development sites and facilities, remote monitoring should be	**HU G4.** For mineral and energy development sites and facilities, remote monitoring should be

LCAS Recommendations	Scoping Proposed Action	DEIS Proposed Action, Alt B	FEIS Preferred Alternative F
monitoring of sites that are located in lynx habitat, so that they do not have to be visited daily.	courage remote monitoring of sites that are located in lynx habitat, so that they do not have to be visited daily.	encouraged to reduce snow compaction.	encouraged to reduce snow compaction.
3. Develop a reclamation plan (e.g., road reclamation and vegetation rehabilitation) for abandoned well sites and closed mines to restore suitable habitat for lynx.	**Other human uses G3.** Develop a reclamation plan (e.g., road reclamation and vegetation rehabilitation) for abandoned well sites and closed mines to restore suitable habitat for lynx.	**HU G5.** For mineral and energy development sites and facilities that are closed, a reclamation plan that improves lynx habitat should be developed.	**HU G5.** For mineral and energy development sites and facilities that are closed, a reclamation plan that restores lynx habitat should be developed.
4. Close newly constructed roads (built to access mines or leases) in lynx habitat to public access during project activities. Upon project completion, reclaim or obliterate these roads.	**Other human uses G4.** Close newly constructed roads (built to access mines or leases) in lynx habitat to public access during project activities. Upon project completion, reclaim or obliterate these roads.	**HU G9.** On new roads built for projects, public motorized use should be restricted. Effective closures should be provided in road designs. When the project is over, these roads should be reclaimed or decommissioned, if not needed for other management objectives.	**HU G9.** On new roads built for projects, public motorized use should be restricted. Effective closures should be provided in road designs. When the project is over, these roads should be reclaimed or decommissioned, if not needed for other management objectives.
MORTALITY RISK FACTORS			
Trapping			
Programmatic objectives for trapping			
1. Reduce incidental harm or capture of lynx during regulated and unregulated trapping activity, and ensure retention of an adequate prey base.	Not included.	*Regulated by states therefore not addressed.*	*Regulated by states therefore not addressed.*
Programmatic guidelines for trapping			
1. Federal agencies should work cooperatively with States and Tribes to reduce incidental take of lynx related to trapping.	Not included.	*Regulated by states therefore not addressed.*	*Regulated by states therefore not addressed.*
Predator control			
Programmatic objectives for predator control			
1. Reduce incidental harm or capture of lynx during predator control activities, and ensure	Not included.	*Responsibility of APHIS.*	*Responsibility of APHIS.*

LCAS Recommendations	Scoping Proposed Action	DEIS Proposed Action, Alt B	FEIS Preferred Alternative F
retention of adequate prey base.			
Programmatic standards for predator control			
1. Predator control activities, including trapping or poisoning on domestic livestock allotments on federal lands within lynx habitat, will be conducted by Wildlife Services personnel in accordance with FWS recommendations established through a formal Section 7 consultation process.	Not included.	*Responsibility of APHIS.*	*Responsibility of APHIS.*
Shooting			
Programmatic objectives for shooting			
1. Reduce lynx mortalities related to mistaken identification or illegal shooting.	Not included.	*Regulated by states therefore not addressed.*	*Regulated by states therefore not addressed.*
Programmatic guidelines for shooting			
1. Initiate interagency information and education efforts throughout the range of lynx in the contiguous states. Utilize trailhead posters, magazine articles, news releases, state hunting and trapping regulation booklets, etc., to inform the public of the possible presence of lynx, field identification, and their status.	Not included.	*Regulated by states therefore not addressed.*	*Regulated by states therefore not addressed.*
2. Federal agencies should work cooperatively with States and Tribes to ensure that important lynx prey are conserved.	Not included	*Not plan direction. Working with states and tribes can and does occur without specific plan direction to do so.*	*Not plan direction. Working with states and tribes can and does occur without specific plan direction to do so.*
Competition & predation – Human activities as mortality risk factors			
Programmatic objectives for competition & predation			
1. Maintain the natural competitive advantage of lynx in deep snow	**HUD O1.** Maintain the natural competitive advantage of lynx in	**HU O1.** Maintain the lynx's natural competitive advantage over other	**HU O1.** Maintain the lynx's natural competitive advantage over other

LCAS Recommendations	Scoping Proposed Action	DEIS Proposed Action, Alt B	FEIS Preferred Alternative F
conditions.	deep snow conditions.	predators in deep snow, by discouraging the expansion of snow-compacting activities in lynx habitat.	predators in deep snow, by discouraging the expansion of snow-compacting activities in lynx habitat.
Programmatic standards for competition & predation			
1. On federal lands in lynx habitat, allow no net increase in groomed or designated over-the-snow routes and snowmobile play areas by LAU. This is intended to apply to dispersed recreation, rather than existing ski areas.	**Dispersed Rec S1.** On federal lands in lynx habitat, allow no net increase in groomed or designated over-the-snow routes and designated snowmobile play areas by LAU, unless the grooming or designation serves to consolidate use and improve lynx habitat. This does not apply to permitted ski areas, winter logging or trail re-routes necessary for public safety.	**HU S1.** Allow no net increase in groomed or designated over-the-snow routes or play areas by LAU, unless the grooming or designation serves to consolidate use and improve lynx habitat. This does not apply inside permitted ski area boundaries, to winter logging, to rerouting trails for public safety, to accessing private inholdings, or to other access regulated by HU S3.	**HU G11.** Designated over-the-snow routes or designated play areas should not expand outside baseline areas of consistent snow compact-tion, unless designation serves to consolidate use and improve lynx habitat. This may be calculated on an LAU basis, or on a combination of immediately adjacent LAUs. This does not apply inside permitted ski area boundaries, to winter logging, to rerouting trails for public safety, to accessing private inholdings or to access regulated by Guideline HU G12. Use the same analysis boundaries for all actions subject to this guideline.
Highways Programmatic objectives for highways as mortality risk factors			
1. Reduce the potential for lynx mortality related to highways.	**HUD O5.** Reduce the potential for lynx mortality related to highways on National Forest lands.	**ALL O1.** Maintain or restore lynx habitat connectivity in and between LAUs, and in linkage areas. **HU O6.** Reduce adverse highway effects on lynx by working cooperatively with other agencies to provide for lynx movement and habitat connectivity, and to reduce the potential for lynx mortality.	**ALL O1.** Maintain or restore lynx habitat connectivity in and between LAUs, and in linkage areas. **HU O6.** Reduce adverse highway effects on lynx by working cooperatively with other agencies to provide for lynx movement and habitat connectivity, and to reduce the potential for lynx mortality.
Programmatic standards for highways as mortality risk factors			
1. Within lynx habitat, identify key linkage areas and potential highway crossing areas	**Linkage S2.** Within lynx habitat, identify key linkage areas and potential highway crossing areas.	**LINK S1.** When highway or forest highway construction or reconstruc-tion is proposed in linkage areas,	**LINK S1.** When highway or forest highway construction or reconstruc-tion is proposed in linkage areas,

LCAS Recommendations	Scoping Proposed Action	DEIS Proposed Action, Alt B	FEIS Preferred Alternative F
		identify potential highway crossings. *(NOTE: In accord with the Conservation Agreement, linkage areas have been mapped; see Appendix B).*	identify potential highway crossings. *(NOTE: In accord with the Conservation Agreement, linkage areas have been mapped; see Appendix B).*
Programmatic guidelines for highways as mortality risk factors			
1. Where needed, develop measures such as wildlife fencing and associated underpasses to reduce mortality risk.	**Highways and roads G3.** Where needed, develop measures such as wildlife fencing and associated underpasses to reduce mortality risk.	**ALL G1.** Methods to avoid or reduce effects on lynx should be used when constructing or reconstructing highways or forest highways across federal land. Methods could include fencing, underpasses, or overpasses.	**ALL G1.** Methods to avoid or reduce effects on lynx should be used when constructing or reconstructing highways or forest highways across federal land. Methods could include fencing, underpasses, or overpasses.
MOVEMENT & DISPERSAL RISK FACTORS			
Programmatic objectives for movement & dispersal			
1. Maintain and, where necessary and feasible, restore habitat connectivity across forested landscapes.	**All Programs S2.** Maintain, and where necessary and feasible restore habitat connectivity within and between LAUs.	**ALL O1.** Maintain or restore lynx habitat connectivity in and between LAUs, and in linkage areas.	**ALL O1.** Maintain or restore lynx habitat connectivity in and between LAUs, and in linkage areas.
Programmatic standards for movement & dispersal			
1. Identify key linkage areas that may be important in providing landscape connectivity within and between geographic areas, across all ownerships.	Not included. *In accord with the Conservation Agreement linkage areas have been mapped (see Appendix B).*	Not included. *In accord with the Conservation Agreement linkage areas have been mapped (see Appendix B).*	Not included. *In accord with the Conservation Agreement linkage areas have been mapped (see Appendix B).*
2. Develop and implement a plan to protect key linkage areas on federal lands from activities that would create barriers to movement. Barriers could result from an accumulation of incremental projects, as opposed to any one project.	Not specifically included. *The linkage objectives and standards identify ways to protect linkage areas.*	Not specifically included. *The linkage objectives and standards identify ways to protect linkage areas. See Link O1, S1, S2, G1, and ALL O1 below.*	Not specifically included. *The linkage objectives and standards identify ways to protect linkage areas. See Link O1, S1, S2, G1, and ALL O1 below.*
3. Evaluate the potential importance of shrub-steppe habitats in providing landscape connectivity between blocks of lynx habitat. Livestock	**Grazing O2.** In lynx habitat and adjacent shrub-steppe habitats, manage grazing to maintain the composition and structure of native	**LINK S2.** Manage livestock grazing in shrub-steppe habitats to contribute to maintaining or achieving a preponderance of mid-	**LINK G2.** Livestock grazing in shrub-steppe habitats should be managed to contribute to maintaining or achieving a

LCAS Recommendations	Scoping Proposed Action	DEIS Proposed Action, Alt B	FEIS Preferred Alternative F
grazing within shrub-steppe habitats in such areas should be managed to maintain or achieve mid seral or higher condition, to maximize cover and prey availability. Such areas that are currently in late seral condition should not be degraded.	plant communities	or late-seral stages, similar to conditions that would have occurred under historic disturbance regimes.	preponderance of mid- or late-seral stages, similar to conditions that would have occurred under historic disturbance regimes.
Programmatic guidelines for movement & dispersal			
1. Where feasible, maintain or enhance native plant communities and patterns, and habitat for potential lynx prey, within identified key linkage areas. Pursue opportunities for cooperative management with other landowners.	**All Programs S2.** Maintain, and where necessary and feasible restore habitat connectivity within and between LAUs.	**LINK O1.** In areas of intermixed land ownership, work with landowners to pursue conservation easements, habitat conservation plans, land exchanges, or other solutions to reduce the potential of adverse impacts on lynx and lynx habitat. **ALL O1.** Maintain or restore lynx habitat connectivity in and between LAUs, and in linkage areas.	**LINK O1.** In areas of intermingled land ownership, work with landowners to pursue conservation easements, habitat conservation plans, land exchanges, or other solutions to reduce the potential of adverse impacts on lynx and lynx habitat. **ALL O1.** Maintain or restore lynx habitat connectivity in and between LAUs, and in linkage areas.
Highways			
Programmatic objectives for highways as movement & dispersal risk factors			
1. Ensure that connectivity is maintained across highway rights-of-ways.	**HUD O6**. Ensure that connectivity is maintained across highway rights-of-way on National Forest and BLM lands.	**ALL O1.** Maintain or restore lynx habitat connectivity in and between LAUs, and in linkage areas.	**ALL O1.** Maintain or restore lynx habitat connectivity in and between LAUs, and in linkage areas.
Programmatic standards for highways as movement & dispersal risk factors			
1. Federal land management agencies will work cooperatively with the Federal Highway Administration and State Departments of Transportation to address the following with lynx geographic areas: Identify land corridors necessary to maintain connectivity of lynx habitat	**Linkage S2.** Within lynx habitat, identify key linkage areas and potential highway crossings. **Other Dev S2.** Identify, map and prioritize site-specific locations, using topographic and vegetation features, to determine where highway crossings are needed to reduce highway impacts on lynx.	**LINK O1.** In areas of intermixed land ownership, work with landowners to pursue conservation easements, habitat conservation plans, land exchanges, or other solutions to reduce the potential of adverse impacts on lynx and lynx habitat. **LINK S1.** When highway or forest	**LINK O1.** In areas of intermingled land ownership, work with landowners to pursue conservation easements, habitat conservation plans, land exchanges, or other solutions to reduce the potential of adverse impacts on lynx and lynx habitat. **LINK S1.** When highway or forest

LCAS Recommendations	Scoping Proposed Action	DEIS Proposed Action, Alt B	FEIS Preferred Alternative F
Map the location of "key linkage areas" where highway crossings may be needed to provide habitat connectivity and reduce mortality of lynx (and other wildlife).		highway construction or reconstruction is proposed in linkage areas, identify potential highway crossings. **LINK G1.** National Forest System and BLM lands should be retained in public ownership. *In accord with the Conservation Agreement linkage areas have been mapped (see Appendix B).*	highway construction or reconstruction is proposed in linkage areas, identify potential highway crossings. **LINK G1.** National Forest System lands should be retained in public ownership. *In accord with the Conservation Agreement linkage areas have been mapped (see Appendix B).*
Programmatic guidelines for highways as movement & dispersal risk factors			
1. Evaluate whether land ownership and management practices are compatible with maintaining lynx highway crossings in key linkage areas. On public lands, management practices will be compatible with providing habitat connectivity. On private lands, agencies will strive to work with landowners to develop conservation easements, exchanges, or other solutions.	**All Programs S2.** Maintain, and where necessary and feasible restore habitat connectivity within and between LAUs. **Linkage O2**. Retain lands in key linkage areas in public ownership. **Linkage S2.** Within lynx habitat, identify key linkage areas and potential highway crossing areas. **Linkage S3.** Evaluate proposed land exchanges, land sales, and special use permits for effects on key linkage areas.	**LINK O1.** In areas of intermixed land ownership, work with landowners to pursue conservation easements, habitat conservation plans, land exchanges, or other solutions to reduce the potential of adverse impacts on lynx and lynx habitat. **ALL O1.** Maintain or restore lynx habitat connectivity in and between LAUs, and in linkage areas. **ALL S1.** New or expanded permanent developments and vegetation management projects must maintain habitat connectivity. **LINK G1.** National Forest System and BLM lands should be retained in public ownership. **ALL G1.** Methods to avoid or reduce effects on lynx should be used when constructing or reconstructing highways or forest highways across federal land. Methods could include fencing, underpasses, or overpasses.	**LINK O1.** In areas of intermingled land ownership, work with landowners to pursue conservation easements, habitat conservation plans, land exchanges, or other solutions to reduce the potential of adverse impacts on lynx and lynx habitat. **ALL O1.** Maintain or restore lynx habitat connectivity in and between LAUs, and in linkage areas. **ALL S1.** New or expanded permanent developments and vegetation management projects must maintain habitat connectivity in an LAU and/or linkage area. **LINK G1.** National Forest System lands should be retained in public ownership. **ALL G1.** Methods to avoid or reduce effects on lynx should be used when constructing or reconstructing highways or forest highways across federal land. Methods could include fencing,

LCAS Recommendations	Scoping Proposed Action	DEIS Proposed Action, Alt B	FEIS Preferred Alternative F
			underpasses, or overpasses.
Project standards for highways as movement & dispersal risk factors			
1. Identify, map, and prioritize site-specific locations, using topographic and vegetation features, to determine where highway crossings are needed to reduce highway impacts on lynx and other wildlife.	**Other Dev S2**. Identify, map, and prioritize site-specific locations, using topographic and vegetation features, to determine where highway crossings are needed to reduce highway impacts on lynx and other wildlife.	**LINK S1.** When highway or forest highway construction or reconstruction is proposed in linkage areas, identify potential highway crossings. **ALL G1.** Methods to avoid or reduce effects on lynx should be used when constructing or reconstructing highways or forest highways across federal land. Methods could include fencing, underpasses or overpasses.	**LINK S1.** When highway or forest highway construction or reconstruction is proposed in linkage areas, identify potential highway crossings. **ALL G1.** Methods to avoid or reduce effects on lynx should be used when constructing or reconstructing highways or forest highways across federal land. Methods could include fencing, underpasses or overpasses.
2. Within the range of lynx, complete a biological assessment of all proposed highway projects of federal lands. A land management agency biologist will review and coordinate with highway departments on development of the biological assessment.	Not included. *Already a requirement under FSM 2671.44 and 16 U.S.C. 1536(c).*	Not included. *Already a requirement under FSM 2671.44 and 16 U.S.C. 1536(c).*	Not included. *Already a requirement under FSM 2671.44 and 16 U.S.C. 1536(c).*
Project guidelines for highways as movement & dispersal risk factors			
1. Dirt and gravel roads traversing lynx habitat (particularly those that could become highways) should not be paved or otherwise upgraded (e.g. straightening of curves, widening of roadway, etc.) in a manner that is likely to lead to significant increases in traffic volumes, traffic speeds, increased width of the cleared ROW, or would foreseeably contribute to development of in-creases in human activity in lynx habitat. Such projects	**Highway G1.** Dirt and gravel roads traversing lynx habitat (particularly those that could become highways) should not be paved or otherwise upgraded (e.g. straightening of curves, widening of roadway, etc.) in a manner that is likely to lead to significant increases in traffic volumes, traffic speeds, increased width of the cleared ROW, or would foreseeably contribute to development of	**HU G6.** Upgrading unpaved roads to maintenance levels 4 and 5 should be avoided in lynx habitat, if the result would be increased traffic speeds and volumes, or a foreseeable contribution to increases in human activity or development.	**HU G6.** Methods to avoid or reduce effects on lynx should be used in lynx habitat when upgrading unpaved roads to maintenance levels 4 or 5, if the result would be increased traffic speeds and volumes, or a foreseeable contribution to increases in human activity or development.

LCAS Recommendations	Scoping Proposed Action	DEIS Proposed Action, Alt B	FEIS Preferred Alternative F
may increase habitat fragmentation, create a barrier to movements, increase mortality risks due to vehicle collisions, and generate secondary adverse effects inducing, facilitating, or exacerbating development and human activity in lynx habitat. Whenever rural dirt and gravel roads traversing lynx habitat are proposed for such upgrades, a thorough analysis should be con-ducted on the potential direct and indirect effects to lynx and lynx habitat.	increases in human activity in lynx habitat. Whenever rural dirt and gravel roads traversing lynx habitat are proposed for an upgrade a thorough analysis should be conducted on the potential direct and indirect effects on lynx and lynx habitat.		
Land ownership as a movement & dispersal risk factor			
Programmatic objectives for land ownership			
1. Retain lands in key linkage areas in public ownership.	**Linkage O2.** Retain lands in key linkage areas in public ownership.	**LINK G1.** National Forest System and BLM lands should be retained in public ownership.	**LINK G1.** National Forest System lands should be retained in public ownership.
Programmatic standards for land ownership			
1. Identify key linkage areas by management jurisdiction(s) in management plans and prescriptions.	Not included. *In accord with the Conservation Agreement linkage areas have been mapped (see Appendix B).*	Not included. *In accord with the Conservation Agreement linkage areas have been mapped (see Appendix B).*	Not included. *In accord with the Conservation Agreement linkage areas have been mapped (see Appendix B).*
Programmatic guidelines for land ownership			
1. In land adjustment programs, identify key linkage areas. Work toward unified management direction via habitat conservation plans, conservation easements or agreements, and land acquisition.	**Linkage O2.** Retain lands in key linkage areas in public ownership. **Linkage S2.** Within lynx habitat, identify key linkage areas and potential highway crossing areas. **Linkage S3.** Evaluate proposed land exchanges, land sales, and special use permits for effects on key linkage areas.	**LINK O1.** In areas of intermixed land ownership, work with landowners to pursue conservation easements, habitat conservation plans, land exchanges, or other solutions to reduce the potential of adverse impacts on lynx and lynx habitat. **LINK G1.** National Forest System and BLM lands should be retained in public ownership. *In accord with the Conservation*	**LINK O1.** In areas of intermingled land ownership, work with landowners to pursue conservation easements, habitat conservation plans, land exchanges, or other solutions to reduce the potential of adverse impacts on lynx and lynx habitat. **LINK G1.** National Forest System lands should be retained in public ownership. *In accord with the Conservation*

LCAS Recommendations	Scoping Proposed Action	DEIS Proposed Action, Alt B	FEIS Preferred Alternative F
		Agreement linkage areas have been mapped (see Appendix B).	*Agreement linkage areas have been mapped (see Appendix B)*
Project standards for land ownership			
1. Develop and implement specific management prescriptions to protect/enhance key linkage areas.	Not specifically included. *The linkage objectives and standards identify ways to protect linkage areas.*	Not specifically included. *The linkage objectives, standards, and guidelines identify ways to protect linkage areas.*	Not specifically included. *The linkage objectives, standards, and guidelines identify ways to protect linkage areas.*
2. Evaluate proposed land exchanges, land sales, and special use permits for effect on key linkage areas.	**Linkage S3.** Evaluate proposed land exchanges, land sales, and special use permits for effect on key linkage areas.	**ALL S1.** New or expanded permanent developments and vegetation management projects must maintain habitat connectivity. **LINK G1.** National Forest System and BLM lands should be retained in public ownership. *An effects analysis on linkage areas is implied in the standards and guidelines.*	**ALL S1.** New or expanded permanent developments and vegetation management projects must maintain habitat connectivity in an LAU and/or linkage area. **LINK G1.** National Forest System lands should be retained in public ownership. *An effects analysis on linkage areas is implied in the standards and guidelines.*
Ski areas & large resorts as movement & dispersal risk factors Programmatic objectives for ski areas & large resorts			
1. When conducting landscape level planning of Federal lands, allocate land uses such that landscape connectivity is maintained.	**Linkage O1**. Within identified key linkage areas, provide for landscape connectivity. **All Programs S2.** Maintain, and where necessary and feasible restore habitat connectivity within and between LAUs. **Linkage S1**. When planning new or expanding recreational developments, maintain connectivity within key linkage areas.	**ALL O1.** Maintain or restore lynx habitat connectivity in and between LAUs, and in linkage areas.	**ALL O1.** Maintain or restore lynx habitat connectivity in and between LAUs, and in linkage areas.

LCAS Recommendations	Scoping Proposed Action	DEIS Proposed Action, Alt B	FEIS Preferred Alternative F
Programmatic standards for ski areas & large resorts			
1. Within identified key linkage areas, provide for landscape connectivity.	**Linkage O1**. Within identified key linkage areas, provide for landscape connectivity. **All Programs S2.** Maintain, and where necessary and feasible restore habitat connectivity within and between LAUs. **Linkage S1.** When planning new or expanding recreational developments, maintain connectivity within key linkage areas.	**ALL O1.** Maintain or restore lynx habitat connectivity in and between LAUs, and in linkage areas.	**ALL O1.** Maintain or restore lynx habitat connectivity in and between LAUs, and in linkage areas.
Project standards for ski areas & large resorts			
1. When planning new or expanding recreation developments, ensure that ~~key~~ *connectivity within* linkage areas are *maintained* ~~protected~~.[2]	**Linkage S1.** When planning new or expanding recreational developments, maintain connectivity within key linkage areas.	**ALL S1.** New or expanded permanent developments and vegetation management projects must maintain habitat connectivity.	**ALL S1.** New or expanded permanent developments and vegetation management projects must maintain habitat connectivity in an LAU and/or linkage area.
Project guidelines for ski areas & large resorts			
1. Plan recreational development, and manage recreational and operational uses to provide for lynx movement and to maintain effectiveness of lynx habitat.	**Dev Rec G4.** Plan recreational development, and manage recreational and operational uses to provide for lynx movement and to maintain effectiveness of lynx habitat.	**HU G3.** Recreation developments and operations should be planned in ways that both provide for lynx movement and maintain the effectiveness of lynx habitat.	**HU G3.** Recreation developments and operations should be planned in ways that both provide for lynx movement and maintain the effectiveness of lynx habitat.

[1] Changes to the LCAS were approved by the Lynx Steering Committee in a letter dated August 28, 2003. See Project Record, LCAS section

[2] Changes to the LCAS were approved by the Lynx Steering Committee in a meeting October 23-24, 2001. See Project Record, LCAS section

Appendix B – Lynx steering committee habitat and linkage area mapping process

INTERAGENCY LYNX AND WOLVERINE STEERING COMMITTEE CHARTER

I. BACKGROUND: In March, 1998, an interagency lynx coordination effort was initiated in response to the emerging awareness of the uncertain status of lynx populations and habitat in the conterminous United States. On July 8, 1998, the U.S. Fish and Wildlife Service (FWS) published a proposed rule to list the Canada lynx in the conterminous United States as a threatened species under the Endangered Species Act of 1973, as amended. On March 24, 2000, the FWS issued a final rule determining that the contiguous U.S. Distinct Population Segment (DPS) of the lynx is threatened. The Interagency Lynx Steering Committee (hereafter, the Committee) was formed in 1999 to provide interagency oversight and coordination of lynx conservation. At the October 26-27, 2000 Committee meeting, it was decided that another carnivore species, wolverine, would be added to the Committee's oversight due to concern for wolverine population and habitat status.

II. ROLE: The Committee provides oversight and direction in the preparation and implementation of management strategies and recovery/conservation efforts for forest carnivores such as Canada lynx and wolverine. Through the Research Subcommittee (see Section IX, page 2), the Committee ensures coordination with the Rocky Mountain Research Station (RMRS) and the broader scientific community, as appropriate, in the preparation and implementation of research and administrative studies.

III. MEMBERSHIP: The membership includes Forest Service Wildlife Directors and Planning Directors from Regions 1, 2, 3, 4, 5, 6, and 9 and a Forest Supervisor; Bureau of Land Management; US Fish and Wildlife Service Regions 1, 3, 5, and 6; National Park Service and invitations for participation to state and wildlife agencies and Indian tribes.

IV. COMMITTEE CHAIR: The Committee Chair is the Deputy Regional Forester, Northern Region Forest Service.

V. ADVISOR(S)

Research Subcommittee
Science Teams
Biology Teams
Planning Teams
Communications Team

VI. INVITEES: The state wildlife agencies and Indian tribes within the historic range of Canada lynx and wolverine in the lower 48 states are invited to become members of the Committee.

VII. MEETINGS: Meetings are held every 6 months as agreed by the U.S. Forest Service and U.S. Fish and Wildlife Service in the "Canada Lynx Conservation Agreement" (February 7, 2000). Additional meetings are scheduled as necessary.
VIII. CONFERENCE CALLS: Conference calls shall be scheduled monthly or as needed.
IX. SUBCOMMITTEES (there is only one at this time)

A. RESEARCH SUBCOMMITTEE

Membership
Chair: Dr. Len Ruggiero, RMRS, Missoula, MT
Dr. Kevin McKelvey, RMRS, Missoula, MT
Dr. Kieth Aubry, Pacific Northwest Research Station, Portland, OR
Dr. John Squires, RMRS, Missoula, MT
US Geological Survey
Academia
State Wildlife Agency

Italicized agencies are memberships that were added at the Committee Meeting on April 30-May 1, 2001. The Chair and existing subcommittee members are responsible for selecting the additional subcommittee members.

Subcommittee Responsibilities
1. Coordinate with land managers to identify and propose needed research programs to the Committee based upon conservation strategy and recovery plan elements.

2. Ensure that technically adequate study plans are in place for all Committee sponsored studies.

3. Establish ad hoc task forces to examine and report on special topics as requested by the Committee.

4. Review research findings and reports for scientific validity and make recommendations to the Committee on their adequacy or relevance for assisting management decisions. Circulate these reports for peer review when necessary.

X. OPERATIONS

A. RESOLUTION OF ISSUES

The Committee operates by consensus, whenever possible. Where the Committee cannot agree on a course of action or policy, the Committee Chair will make the decision. The Chair will take into consideration all points of view, and when appropriate, further consult with agency leaders prior to making the decision.

B. PROCEDURES TO AMEND CONSERVATION STRATEGIES

Purpose

Conservation strategies such as the Lynx Conservation Assessment and Strategy (LCAS) August, 2000 may be amended when research results or other relevant information indicate there is a valid, scientific documentation to improve conservation efforts by revising any aspect of the conservation strategy including the conservation program or management recommendations.

Process

1. The proponent of a proposal to amend a conservation strategy shall submit a written request for consideration to the Committee Chair. This proposal shall include all scientific evidence, reports, scientific publications or other documentation that support the proposed change. The Committee shall determine the best course of action and assign the review of the proposal to the appropriate teams.

2. The Research Subcommittee or Science Team shall facilitate the technical review and assess the scientific validity of the proposal. This review shall include a written recommendation regarding acceptance of the proposed modification. Allow a minimum of 60 days for this review.

3. The Biology Team shall review the proposal after receiving the Research Committee/Science team technical report and make a written recommendation to the Committee regarding acceptance of the proposed modification. Allow a minimum of 60 days for this review.

4. Forward the proposal and written recommendation(s) to the Committee for action.

5. When a proposed amendment to a conservation strategy is approved it shall receive a sequential number and be officially attached to the conservation strategy. The amendment shall specify which language in a conservation strategy is modified and the precise area of geographic application.

6. When a conservation strategy is amended, the Committee member agencies shall apply this new information in their operations as appropriate.

Definitions

Biology Team – Interagency wildlife biologists that apply scientific data and management principles to develop an assessment of risks to a particular species or group of species, thereby formulating the basis for management guidance that conserves species and habitats described in the conservation strategy. The team advises the Steering Committee on the merits of proposals to amend conservation and management strategies based upon scientific analysis provided by science teams or the Research Subcommittee.

Science Team – Scientists that review and interpret data to provide a scientific basis for management and conservation of species. The team advises the Steering Committee on the merits and scientific basis of proposals to amend conservation strategies.

Planning Team – Land and resource land management planning and resource specialists that advise the Steering Committee on strategies and approaches to amend or revise federal land and resource management plans to consider the new information in conservation strategies.

April, 2002

United States Department of Agriculture Forest Service	United States Department of Interior Bureau of Land Management	United States Department of Interior Fish and Wildlife Service

File Code: 2670 **Date:** August 22, 2000

Subject: Lynx Habitat Mapping Direction

To: Regional Foresters and Forest Supervisors (Regions 1, 2, 4, 6 & 9)

Bureau of Land Management State Offices and Districts (MT, OR, ID, WA, WY, UT & CO)

U.S. Fish and Wildlife Service (Regions 1, 3, 5 & 6)

Since implementation of the Lynx Conservation Assessment and Strategy (LCAS), questions have arisen from the field regarding mapping of lynx habitat. At the request of the Lynx Steering Committee, the Lynx Biology Team met on July 11-12, 2000, to respond to the questions. Several members of the Lynx Science Team and U.S. Fish and Wildlife Service consultation biologists from Idaho, Oregon, and Washington joined the Lynx Biology Team.

The Biology Team presented their recommendations to the Steering Committee on July 18; the recommendations were accepted, and the Steering Committee is providing the following direction to field units on mapping criteria and procedures (direction for mapping lynx habitat is enclosed). Please review your existing lynx habitat maps to ensure they are consistent with the following criteria:

1. Begin using the outer boundary as described in figures 8.20 (for the western U.S. - note: modifications have been made for the Blue Mountains and Southern Colorado areas), figure 8.22 (for the Great Lakes), and figure 8.23 (for the Northeast). These figures are found in Chapter 8, History and Distribution of Lynx in the Contiguous United States, in the Ecology and Conservation of Lynx in the United States. If you would like an electronic copy of the above maps, contact a Lynx Biology Team member from your Geographic Area.
2. In the western U.S., areas below 4,000 feet usually should be excluded.
3. Within the boundaries defined by Steps 1 and 2, map vegetation that can contribute to lynx habitat as described in the enclosure for each Geographic Area. These vegetation descriptions are being incorporated into the updated LCAS, which will be available and posted in August 2000.

4. Delineate Lynx Analysis Units (LAUs) around the habitat defined above.

Conservation Measures listed in the LCAS apply only within lynx habitat in the LAUs, except for those specific to connectivity.

Units involved in the national lynx monitoring effort should continue to participate until lynx presence or absence is established.

If you have questions about the mapping procedures, contact your agency's Lynx Biology Team representative.

/s/ KATHLEEN A. McALLISTER */s/ TERRY SEXSON (for)* */s/ CHRIS JAUHOLA*

KATHLEEN A. MCALLISTER	RALPH MORGENWECK	CHRIS JAUHOLA
Deputy Regional Forester	Region 6 Director, FWS	Group Manager, Fish,
Northern Region, FS		Wildlife, & Forests,
BLM		

Enclosure

cc: Lynx Steering Committee, Biology Team, Science Team

To: Lynx Steering Committee

From: Lynx Biology Team

Date: 2/23/2007

Re: Recommendations - Lynx Habitat Mapping

At the Lynx Steering Committee conference call on May 23, 2000, several questions about habitat mapping were raised. The Lynx Biology Team met on July 11 and 12, 2000, to discuss and resolve these issues. Five members of the Science Team participated on July 11 in an advisory capacity, and three FWS consultation biologists from Washington, Oregon, and Idaho attended both days.

A set of mapping criteria and procedures was developed to guide and clarify the mapping process. The consequences of applying these criteria were also assessed.

Criteria and Procedures for Lynx Habitat Mapping

4) Information contained in the Science Team Report (Ruggiero et al. 2000a) provides the starting point for lynx habitat mapping. The outer boundary that should be used for each geographic area is shown in Chapter 8 (McKelvey et al. 2000): Figs 8.20 for western U.S., Fig. 8.22 for the Great Lakes, and Fig. 8.23 for the Northeast (these are combined into the insert map entitled "Vegetation Types and Elevation Zones Associated with Lynx Occurrences"), with the following exceptions.

In southern Colorado and northeastern Oregon and southeastern Washington, the Rocky Mountain Conifer Forest type as depicted in Fig. 8.19 should be added to the outer boundary. These areas were lost in the transition to Fig. 8.20 due to vagaries of the Kuchler delineations of vegetation subtypes, rather than lack of historical occurrences (K. McKelvey, pers. comm. 2000).

1) In the western U.S., lynx occurrences generally are found only above 4,000 ft. elevation (McKelvey et al. 2000). Areas below 4,000 ft. usually should be excluded. Note that elevation ranges are specified in the geographic area descriptions in the Lynx Conservation Assessment and Strategy.

2) Within the boundaries defined by the first two steps, map vegetation that could contribute to lynx habitat, as described for each geographic area in the Lynx Conservation Assessment and Strategy, using the finest-scale vegetation information that is available. The following clarifies primary and secondary vegetation for the western U.S.

    a) Mesic subalpine fir forests in the western U.S. are extensions of boreal forests. Subalpine fir habitat types dominated by cover types of spruce/fir, Douglas-fir, and seral lodgepole pine should be mapped as primary vegetation. These types must be present to support foraging, denning and rearing of young.

b) Other cool, moist habitat types (e.g., some Douglas-fir, grand fir) may contribute to lynx habitat where intermingled with and immediately adjacent to primary vegetation. These types are described as secondary vegetation.

c) Lynx do not appear to be associated with dry forest habitat types (e.g., ponderosa pine, dry Douglas-fir, and dry or climax lodgepole pine) except to move among mesic stands (Ruggiero et al. 2000b). These dry types should not be included as vegetation contributing to lynx habitat.

3) The next steps are to identify lynx habitat within a Lynx Analysis Unit (LAU), which involves consideration of several additional factors:

a) Determine whether the amount and spatial arrangement of vegetation is sufficient to warrant delineating a LAU (amount, patch size, inter-patch distance).

b) Evaluate land ownership pattern (to assess feasibility of achieving lynx conservation objectives on federally administered lands, to determine appropriate size and configuration of the LAU, etc.).

c) Review occurrence records of all types to assess validity of identifying the area as lynx habitat - location, pattern, consistency, year in relation to Canadian population cycles. Evaluate the records as described in Chapter 8 (McKelvey et al. 2000). Lack of records in an area does not necessarily indicate lack of habitat; conversely, detections do not necessarily indicate lynx habitat. Independently, occurrence records indicate only occurrence. Collectively, as a data set, occurrences can reveal habitats that likely are important to lynx.

Snow depth information may be useful to exclude ungulate winter ranges and areas that do not retain adequate snow cover during the winter.

Note: *Once identified as "lynx habitat," there is no longer a distinction between primary and secondary vegetation. Conservation measures of the Lynx Conservation Assessment and Strategy (LCAS) apply to lynx habitat.*

Consequences of Applying the Criteria

The lynx Biology Team reviewed methods used to date in each geographic area, to determine whether mapping was consistent with the above set of criteria. The team also indicated whether changes might be needed in LCAS Appendix A, "List of Administrative Units Involved in Conferencing/Consultation for Lynx."

Northeast and Great Lakes Geographic Areas

Mapping is believed to be consistent with these criteria and process. Two units (Green Mountain and Chequamegon-Nicolet National Forests) should be deleted from Appendix A (concurrence already received from FWS).

Southern Rockies Geographic Area

Mapping is believed to be consistent with these criteria and process (with the addition of the southern Colorado Kuchler type). No changes are needed in Appendix A.

Northern Rockies Geographic Area

Montana - Mapping is believed to be consistent with these criteria and process. No changes are needed for the list of units included in Appendix A.

Wyoming - Mapping is believed to be consistent with these criteria and process, although it was uncertain whether slope had been used to screen out areas (not supported by the Biology Team). The Biology Team was asked to review the Bighorns, and recommended that they continue to be included. Therefore no changes to Appendix A are anticipated.

Idaho - Mapping is believed to be consistent with these criteria and process, except that in central Idaho, moist Douglas-fir has been mapped as primary vegetation. In this region, Douglas-fir differs ecologically from other areas, occurring at higher elevations and on cooler sites, and provides high-quality snowshoe hare habitat. Mapping within the isolated mountain ranges of southeastern Idaho had been put on hold, and will be completed with consideration of the amount and spatial arrangement of vegetation. No changes to Appendix A are anticipated at this time.

Utah - Mapping is believed to be consistent with these criteria and process. Although there are comparatively few occurrence records in Utah, their distribution is very clumped, which suggests persistence of a local population. No changes to Appendix A are anticipated.

SE Washington and NE Oregon - Mapping is believed to be consistent (with the addition of the Rocky Mountain Conifer Kuchler type from Fig. 8.19). No changes to Appendix A are anticipated.

Cascade Mountains Geographic Area

Discussion centered on whether the Pacific silver fir and mountain hemlock Kuchler types should be considered as primary vegetation. Both the Rocky Mountain Conifer Forest (RMC) and Pacific Northwest Conifer Forest (PNC) are included in Fig. 8.19, while Fig. 8.20 narrows this down to the Douglas-fir and western spruce/fir subtypes of the RMC type, and the fir/hemlock subtype of the PNC type. Lynx are absent or uncommon in dense, wet forests along the Pacific coast (Aubry et al. 2000). In the western U.S., Rocky Mountain Conifer Forest contained 83% of all lynx records, but only 27% of the area, suggesting a strong association between lynx occurrences and this type. The Pacific Northwest Conifer had the second highest point frequency, but this represented only 7% of occurrences within about 7% of the area, indicating a weaker association. The Pacific Northwest Conifer type extends west of the Cascade Range to the coast and southward into northern California, although lynx occurrences were located only in areas adjacent to Rocky Mountain Conifer Forest. In addition, the snowshoe hare prey base appears to decline from north to south within the Cascades. There is little evidence to suggest that the silver fir/hemlock subtype actually supports lynx.

The historical occurrence record for Oregon is significantly smaller than for Washington. McKelvey et al. (2000) documented 134 verified occurrences (78 museum specimens) in Washington, compared with 12 verified occurrences in Oregon (9 museum specimens). There are a total of 765 records from Washington plus 200 trapping records, compared with a total of 72 records from Oregon. Unlike the clustering of occurrences seen in Washington and Utah, for example, which are suggestive of resident populations, lynx occurrences in Oregon are much more scattered and include several from anomalous habitats.

The Bio Team recommends the following for Washington and Oregon

4) Map vegetation using Fig. 8.20 as the outer boundary as described above.

5) Because of the uncertainty as to whether Pacific silver fir/mountain hemlock constitutes primary vegetation, do not identify these vegetation types as lynx habitat. Also, do not delineate LAUs or apply the LCAS west of the crest of the Cascades unless subalpine fir vegetation types occur in amounts and distribution great enough to establish an LAU. Lynx surveys and/or snowshoe hare information should continue to be collected through cooperative efforts of the Forest Service and the U.S. Fish and Wildlife Service.

6) On the east side of the Cascades, continue mapping with subalpine fir habitat types as primary vegetation. Identify lynx habitat and delineate LAUs using the process and criteria described above.

7) The results of the mapping will indicate whether any administrative units should be removed from Appendix A of the LCAS due to insufficient amounts or arrangement of lynx habitat.

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United States Department of Agriculture
Forest Service
Region One
200 East Broadway
P.O. Box 7669
Missoula, MT 59807

File Code: 2670
Date: June 24, 2002

Dear :

Interagency/intergovernmental meetings were held recently to identify and recommend lynx linkage habitat locations within and adjacent to the states of Idaho, Montana, Utah and Wyoming. The identification of lynx linkage areas was a task identified in the *Canada Lynx Conservation Agreements* jointly signed by the Bureau of Land Management and the U.S. Forest Service and the U.S. Fish and Wildlife Service in August and February 2000, respectively. The U.S. Forest Service's Northern Regional Office Wildlife Staff in Missoula assisted in setting up and facilitating these meetings as well as digitizing the Draft map. The meetings were held in the following locations:

Missoula, MT - July 11, 2001
Boise, ID - November 28, 2001
Salt Lake City, Utah - April 17, 2002
Cody, WY - April 16, 2002
Cheyenne, WY - April 18, 2002

Participants included staff from the Bureau of Land Management, Fish and Wildlife Staff from the U. S. Forest Service's Northern Region Regional Office, U. S. Forest Service, State Fish and Wildlife Agencies, National Park Service, Native American Tribes, State and Federal Highway Departments, and the U. S. Fish and Wildlife Service.

The product of these meetings is a digitized map for your staff review. A map with lynx linkage areas identified for the state of Montana was sent out for review in February 2000 to state and federal agencies and Native American tribes in Montana for review. The current version of the map includes lynx linkage habitat in all four states. The linkage map is available on the following site

ftp://ftp.fs.fed.us/incoming/r1/ro/lynx_linkage.pdf

Additional instructions for viewing and/or printing the map are attached. If you do not have a plotter to print this map please contact Tim Bertram of the U.S. Forest Service Northern Regional Office at (406) 329-3611 and we will send you a hard copy of the map. I would appreciate any comments you may have by no later than **July 23, 2002**.

The revised definition of lynx linkage areas as approved by the Lynx and Wolverine Steering Committee (Oct 2001) is: **Areas that provide landscape connectivity between blocks of lynx habitat. Linkage areas occur both within and between geographic areas where blocks of lynx habitat are separated by intervening areas of non-lynx habitat such as basins, valleys, agricultural lands, or where lynx habitat naturally narrows between two blocks.**
Criteria that were considered in recommending lynx linkage areas are:

1) High density human developments (town sites, high density homes)
2) Linkages between blocks of lynx habitat including shrub/steppe habitats which link forested blocks of lynx habitat
3) Willow riparian habitat across valley bottoms
4) High percentage of public lands within the area
5) Known information concerning animal crossing locations

Other criteria that should be considered in relation to roads and highways are:

1) High traffic volume highways (may be two or four lane)
2) Presence of four lane highways
3) Highways which parallel railroad routes
4) Presence of numerous physical impediments (Jersey and Texas rail type barriers)
5) Where plans exist to upgrade or improve a highway (e.g. widening, barrier installation)
6) Expected or planned growth along or nearby existing road

The recommended linkage areas will be provided to the Lynx and Wolverine Steering Committee for review, concurrence and distribution for reference in land management and highway planning efforts, and for consideration in the Endangered Species Act Section 7 consultation process.

If you have any further questions regarding the mapping of lynx linkage areas please contact Tim Bertram (406-329-3611) at the U.S. Forest Service Northern Regional Office.

/s/ Kathleen A. McAllister

KATHLEEN A. MCALLISTER
LYNX/WOLVERINE STEERING COMMITTEE CHAIRPERSON AND
DEPUTY REGIONAL FORESTER

United States Department of Agriculture **Forest Service** **Region One**

200 East Broadway
P.O. Box 7669
Missoula, MT 59807

File Code: 2670 **Date:** November 13, 2003
Route To:

Subject: Lynx Linkage Areas

To: Marc Bosch, Forest Supervisors (1, 2, 4, 6, 9), Bureau of Land Management State Offices and Districts (CO, ID, MT, UT, WA, WY), U.S. Fish and Wildlife Service (Regions 1, 3, 5, 6), Directors of Fish & Wildlife Agencies: Montana, Idaho, Wyoming, Utah, Oregon, Washington, Colorado, Minnesota, Michigan, Wisconsin, New Hampshire and Vermont,

In the *Canada Lynx Conservation Agreements* signed by the U.S. Forest Service and the Bureau of Land Management with the U.S. Fish and Wildlife Service in February and August of 2000, respectively, the agencies agreed to identify lynx linkage areas. Lynx linkage areas are intended to maintain connectivity and allow for movement of animals between blocks of habitat that are otherwise separated by intervening non-habitat areas such as basins, valleys and agricultural lands, or where habitat naturally narrows due to topographic features. Interagency/intergovernmental meetings were held in the states of Idaho, Montana, Utah, Wyoming, and Colorado during 2001 and 2002 to identify and recommend the general locations of lynx linkage areas. Participants in these meetings included representatives from state wildlife agencies and state departments of forestry and transportation, and federal agencies including Federal Highway Administration, Bureau of Land Management, National Park Service, USDA Forest Service, tribal governments, private conservation groups, and others.

The U.S. Forest Service's Regional Offices in Missoula, MT, Ogden, UT, and Lakewood, CO assisted in setting up and facilitating these meetings, as well as digitizing the maps. Draft maps were sent out for review by affected agencies during June-July of 2002 for the Northern Rockies Geographic Area, and during October-November of 2002 for the Southern Rockies Geographic Area. The Lynx/Wolverine Steering Committee reviewed the maps at their October, 2002 meeting and gave their final approved at their November, 2003 meeting. The maps are now available for your consideration in land management and highway planning efforts, and in Endangered Species Act Section 7 consultations.

The maps are available on the U.S. Forest Service Forest Carnivore website:
http://www.fs.fed.us/r1/wildlife/carnivore/

The lynx linkage areas are coarsely mapped at a broad scale, and these maps should be considered a beginning point only. We expect to further refine their locations as more information becomes available, and as projects are proposed in these areas.

If you have any further questions, please contact Jim Claar (406-329-3664) or Tim Bertram (406-329-3611) in the Northern Regional Office in Missoula, or Nancy Warren (303-275-5064) in the Rocky Mountain Regional Office in Lakewood.

/s/ Kathleen A. McAllister
KATHLEEN A. MCALLISTER

Chairperson Lynx & Wolverine Steering
Committee□□Deputy Regional Forester

Appendix C – Acres of lynx habitat

Table C-1. Acres of lynx habitat by unit and acres of occupied and unoccupied habitat

	Unit size - acres	Lynx habitat - acres	Lynx habitat - Percent	Occupied lynx habitat acres	Unoccupied lynx habitat acres
NATIONAL FOREST					
Idaho					
Clearwater	1,825,397	930,000	51%	930,000	0
Idaho Panhandle	2,498,234	1,170,000	47%	1,170,000	0
Nez Perce	2,224,230	810,000	36%	0	810,000
Salmon-Challis	4,350,827	1,800,000	41%	0	1,800,000
Targhee	1,810,854	1,050,000	58%	1,050,000	0
Montana					
Beaverhead-Deerlodge	3,360,825	2,060,000	61%	0	2,060,000
Bitterroot	1,580,948	640,000	40%	0	640,000
Custer	1,187,621	230,000	19%	200,000	30,000
Flathead	2,355,592	1,730,000	73%	1,730,000	0
Gallatin	1,806,565	870,000	48%	770,000	100,000
Helena	975,387	440,000	45%	330,000	110,000
Kootenai	2,242,486s	1,010,000	45%	1,010,000	0
Lewis and Clark	1,862,289	970,000	52%	380,000	590,000
Lolo	2,082,784	1,110,000	53%	1,110,000	0
Utah					
Ashley	1,384,136	700,000	51%	0	700,000
Wyoming					
Bighorn	1,107,671	310,000	28%	0	310,000
Bridger-Teton	3,437,527	2,000,000	58%	2,000,000	0
Shoshone	2,436,850	640,000	26%	640,000	0
TOTAL	38,530,223	18,470,000	48%	11,320,000	7,150,000

Unit size acres are from the Forest Service website, at www.fs.fed.us/land/staff/lar/.
Lynx habitat acres are estimates from computerized map modeling.
Acres of occupied and unoccupied lynx habitat come from the map associated with the Occupied mapped lynx habitat amendment to the Canada Lynx Conservation Agreement (USDA FS, USDI FWS 2006) (FEIS Figure 1-1)

Appendix D – Schedule for revising plans

Table D-1. Schedule for revising NF plans in the Northern Rockies Geographic Area

	Year revision initiated	Year revision complete or expected
Region 1		
Beaverhead-Deerlodge	2001	2006
Bitterroot	2003	2007
Clearwater	2003	2007
Custer		
Flathead	2001	2006
Gallatin		
Helena		
Idaho Panhandle	2001	2007
Kootenai	1996	2007
Lewis & Clark		
Lolo	2002	2007
Nez Perce	2003	2007
Region 2		
Bighorn	1999	2005
Shoshone	2004	2007
Region 4		
Ashley	2004	2007
Boise	*1998*	*2003*
Bridger-Teton	2005	2008
Targhee		1997
Payette	*1998*	*2003*
Salmon-Challis		
Sawtooth	*1999*	*2003*
Uinta	*1999*	*2003*
Wasatch-Cache	*1998*	*2003*
Region 6		
Colville	*2003*	*2007*
Malheur	*2004*	*2007*
Ochoco		
Umatilla	*2004*	*2007*
Wallowa-Whitman	*2004*	*2007*

NFs in italics are not part of the Northern Rockies lynx amendment
From September 26, 2006 schedule www.fs.fed.us/emc/nfma/includes/LRMPschedule.pdf

Appendix E — Management area categories

Non-developmental = Categories 1-3

1. Natural, unmodified environments
In *natural, unmodified environments,* ecological processes such as fire, insects, and disease operate relatively free from human intervention. Diversity resulting from natural succession and disturbance predominate and non-native vegetation is rare.

Users must be self-reliant and expect little contact with others. Few if any structural improvements exist; travel is usually non-motorized.

Natural, unmodified environments are usually Designated Wilderness, Wilderness Study Areas, Research Natural Areas, backcountry lands, or rivers that are designated, suitable, or eligible for classification as Wild Rivers.

2. Special natural areas
In *special natural areas,* representative or rare, narrowly distributed ecological settings or components are conserved, helping to make sure the pieces and functions are saved to provide for the overall sustainability of larger landscapes.

The influences of humans on the ecosystem are sometimes evident. Human uses vary but generally are non-intensive. Travel is generally non-motorized.

Some of these areas serve as a "natural" reference for areas that are heavily managed for particular objectives.

Special natural areas are often formally designated. They include some Research Natural Areas, most Areas of Critical Environmental Concern, many old growth reserves, rivers that are designated, suitable, or eligible for classification as Scenic Rivers outside of Wilderness, and some other areas.

3. Essentially unmodified forested and grassland ecosystems
In *essentially unmodified forested and grassland ecosystems,* although characterized by natural appearing landscapes, an array of management tools may be used to restore or maintain ecological processes, resulting in some evidence of human activities. Normally, natural processes and patterns predominate.

Ecological values are in balance with human occupancy, and consideration is given to both. Users may expect to experience some challenge and risk. Restrictions on motorized travel vary from area to area and season to season.

Essentially unmodified forested and grassland ecosystems include lands unsuitable for timber production that have no planned harvest, special-status species habitat areas, and areas designated for and occupied by wild horses or burros.

Developmental = Categories 4-8

4. Natural appearing, but modified for human use and occupancy
In areas that are *natural appearing, but modified for human use and occupancy,* ecological values are managed to provide recreational use, but maintained well within levels necessary to maintain

ecological systems. Resource use is not emphasized and has little impact.

Sights and sounds of humans can be expected. Motorized transportation is common.

Such lands include environmental education sites, rivers that are designated, suitable or eligible for classification as recreational, non-linear recreation sites and areas, and all other Areas of Critical Environmental Concern not included in special natural areas.

5. Modified forest ecosystems
Modified forest ecosystems are primarily forested ecosystems managed to meet a variety of needs. Ecologic conditions will be maintained with an emphasis on selected structures and compositions within the range of natural variability.

These lands often display high levels of forest management investment, use or activity, evidence of vegetative manipulation, and many facilities.

Users expect to see other humans and the evidence of human activities. Motorized transportation is common.

6. Modified grassland
Modified grasslands are grasslands but include many woodland ecosystems, managed to meet a variety of needs. Ecologic objectives are likely to emphasize selected structures and compositions within the range of natural variability.

These lands often display high levels of forest management investment, use or activity, evidence of vegetative manipulation, and many facilities. A wide variety of structure and composition is present.

Users expect to see other humans and the evidence of human activities. Motorized transportation is common.

7. Areas modified by human occupation and activities
In *areas modified by human occupation and activities,* public lands are intermingled with private lands to the point that public landowners cannot effectively manage for ecological values without the support and cooperation of the private sector.

Human activities have altered the natural appearances in most of these areas. The sight and sound of humans predominates. Private land use is often intensive agriculture, industrial, or residential.

Resource use may not be planned on a sustainable basis but may occur in concert with surrounding private land values. Motorized transportation is common.

8. Modified non-sustainable areas
In *modified non-sustainable areas,* ecological conditions and processes likely are or have been permanently altered by humans beyond the point where natural appearing landscapes and ecological processes can be maintained. The areas are generally small; they may include mines or other concentrated uses.

Ecological values are protected where they affect the heath and welfare of humans. Human activities are generally commercial, directly or indirectly providing jobs and income. Motorized transportation is common.

Appendix F - Lynx research in the contiguous United States

Table F-1. Lynx research in the contiguous United States

Principal investigators	Focus	Location	Methods	Duration	Comments
Completed					
K. Aubry USFS, PNWRS, G. Koehler WDFW & J. von Kienast U. of Washington	- Habitat relationships - Relationships with prey & other predators - Food habits	Cascade Mountains (North-central Washington)	Snow tracking and hair snagging	Dec 2000 - Mar 2001; Mar 2001 - Dec 2002	Investigate fine-scale habitat selection by lynx in a landscape composed of unharvested, recently harvested and recently burned forests.
D. Ausband U. of Montana, R. Baty Montana DNRC	Short term effects of precommercial thinning	Northern Rockies (Stillwater State Forest, Montana)	Pellet counts & track surveys	2001 - 2003	Examine short-term effects on snowshoe hares from various harvest retention prescriptions. Publication in 2005 in *Can. J. For. Res.* 35:2006-2010
S. Brainerd (1985, unpublished)	- Demography & population dynamics - Movements & dispersal	Northern Rockies (western Montana)	Carcass examination & radio-telemetry	25 months	18 females w/mean litter size of 3.3 2 lynx monitored
D. Brittell, et al. (1989, unpublished) WDFW	- Community interactions - Demography & population dynamics - Distribution & abundance - Habitat relationships - Movements & dispersal	Cascade Mountains (north-central Washington)	Radio-telemetry	34 months	23 lynx monitored
S. Buskirk & J. Zahratka U. of Wyoming	- Habitat relationships of - snowshoe hares	Southern Rockies (Colorado - Rio Grande and Gunnison NFs)	Mark & re-observation	2001-2002	M.S. Thesis completed; manuscript submitted for publication

Principal investigators	Focus	Location	Methods	Duration	Comments
J. Brocke, et al (1991)	Human impacts	Northeast (New York)	Radio-telemetry	24 months	83 lynx translocated from the Yukon 16 road-killed
A. Fuller (1999, unpublished)	Stand- and sub-stand habitat relationships of snowshoe hare	Northeastern United States (North-central Maine)	Pellet counts, vegetation measurements	1997 - 1998	Compared density of snowshoe hare among mature, regenerating clearcut, and partially harvested stands. Developed a model to predict density of hares based on within-stand habitat variables.
A. Fuller (2006, Ph.D.)	Multi-scalar responses of forest carnivores to habitat and spatial pattern: Case studies with Canada lynx and American martens including lynx movements and habitat use	Northeastern United States (NW Maine)	Snow tracking, radio telemetry	2002-2003	
J. Homyack, D. Harrison U. of Maine, W. Krohn USGS Maine Cooperative Fish and Wildlife Research Unit	- Determine the stand-level effects of precommercial thinning (PCT) on snowshoe hares, 1-11 years post-treatment - Determine the effects of PCT on small mammals, 1-16 years post-treatment - Develop predictive relationship of hare density relation to overstory, understory & structural variables.	Northern Maine	Mark-recapture of small mammals and snowshoe hare, pellet counts, red squirrel call counts, intensive and extensive habitat measurements.	2000 - 2002	Sampled hare pellet density on 30 herbicide-treated clearcuts (17 treated with PCT, 13 control) Mark-recap of hares on subset of 8 stands Live-trap small mammals on 37 herbicide treated clearcuts (24 treated with PCT, 13 control) Publications in *Forest Ecology and Manage.* (2004) and *Wildlife Society Bulletin* (2005)

Principal investigators	Focus	Location	Methods	Duration	Comments
C. Hoving, D. Harrison U. of Maine, W. Krohn Maine Coop F&W Research Unit	- Distribution & abundance (historical & current) - Habitat relationships (broad-scale & meso-scale) - Habitat relationships of snowshoe hare	Northeastern U.S. and Maritime Canada (meso-scale analysis in NW Maine)	GIS modeling using museum & historical records, trapping data, and track surveys	1833 - 1999 for distribution 1987 - 1999 GIS models	Records of 1,150 lynx from 7 states and 3 provinces & predictive power of 94%, model driven by mean annual snowfall & deciduous forest. Lynx abundant in Maine before 1900. Select regenerating forest over mature forest in Maine. M. S. thesis; Publications in *Northeastern Naturalist* (2003), *Wildlife Biology* (2004) and *J. Wildlife Manage.* (2005)
G. Koehler – WDFW, K. Hodges, L.S. Mills and C.Walker (U of Montana (2005, M.S. Thesis – C. Walker)	- Habitat relationships of snowshoe hares	Cascade Mountains (North-central Washington)	Mark-recapture, telemetry and pellet counts of snowshoe hares	Summers of 2003 and 2004	Investigate habitat selection, densities and movement patterns of snowshoe hares at multiple spatial scales (study conducted in both lynx study areas in north-central WA); M.S. thesis completed
G. Koehler – WDFW, K. Aubry USFS, PNWRS, R. Weilgus and B. Maletzke – WA State University	- Habitat relationships - Relationships with prey and other predators - Food habits	Cascade Mountains (North-central Washington)	Snow tracking	Dec 2002 March 2003 Dec 2003 Mar 2004	Investigate coarse-scale habitat selection by lynx in managed landscape (companion study to one by Aubry, Koehler and von Kienast conducted from 2000-2002 but located in different study area)
G. Koehler (1990) WDFW	- Demography & population dynamics - Distribution & relative abundance - Relationships with prey	Cascade Mountains (North-central Washington)	Radio-telemetry	25 months	7 lynx monitored
G. Koehler, et al (1979) WDFW	- Community interactions - Habitat relationships	Northern Rockies (Western Montana)	Radio-telemetry	8 months	2 lynx; patterns of association with forest types

Principal investigators	Focus	Location	Methods	Duration	Comments
K. McKelvey, G. McDaniel (2001) USFS, RMRS	- Habitat relationships of snowshoe hares	Northern Rockies (Island park, Targhee NF, Idaho)	Pellet counts, capture/recapture, winter track counts	2000 - 2001	Sampled different forest types, stand ages and thinned & unthinned stands
K. McKelvey, et al. (2000) USFS, RMRS	- Distribution & abundance - Habitat relationships	Contiguous U.S.	Museum & historical records, trapping data, track surveys, questionnaire	n/a	3,865 occurrence records & historical distribution
K. McKelvey, et al. (2000) USFS, RMRS	- Habitat relationships - Human impacts	Cascade Mountains (North-central Washington)	Radio-telemetry	76 months	Reanalyzed data from two previous studies (Brittell et al. 1989, Koehler 1990), 1981-1988 22 lynx monitored No road avoidance (non-winter)
L.S. Mills – U of Montana	- Abundance of hares across time and space - Evaluation of pellet counts as indices of abundance	Seeley and Talley Lake regions of NW Montana	Mark-recapture and pellet counts	1998-2002	Hare pellets were evaluated as an index of density using 436 site-area-season combinations with both pellet counts and mark-recapture density estimates; published in *J. Wildlife Manage* (2005)
L.S. Mills, K. Pilgrim, M. Schwartz U. of Montana, K. McKelvey USFS, RMRS (2000)	- Species identification of lynx based upon hairs.	Northern U.S.	MtDNA analysis of hair samples	1999 - 2001	Developed a thoroughly reliable, validated diagnostic test to distinguish among the felids of northern north America.
L.S. Mills & P. Griffin - U. of Montana	- Snowshoe hare fecundity, mortality, survival and movements	Northern Rockies (Seeley Lake, Montana)	Radio-telemetry, trapping, ultrasound	1998 - 2002	Assessed effects of precommercial thinning on hares. Publication in press *J. Wildlife Management.* Finished Ph.D. dissertation in 2003
K. Murphy Yellowstone NP	- Lynx presence and distribution in Yellowstone National Park	Yellowstone National Park	Snow tracking surveys, hare snare surveys	2001-2004	Final report completed and publication in press (*Northwest Science*)

Principal investigators	Focus	Location	Methods	Duration	Comments
M. Schwartz & S. Mills U. of Montana, K. McKelvey, L. Ruggiero & F. Allendorf USFS, RMRS	- Population dynamics	Alaska, western Canada, NW Montana	DNA analysis	1999 - 2001	Used micro satellite loci to estimate gene flow among lynx populations Implies persistence of lynx in contiguous U. S. depends upon dispersal from larger populations; connectivity between northern & southern populations important Paper published in *Nature* (2002)
J. Shaw & J. Long, (2001) Utah State U.	- Habitat relationships of snowshoe hares	Northern Rockies (N. Utah & S. Idaho - Ashley, Wasatch-Cache & Caribou-Targhee NFs)	Pellet counts & vegetative measurements	1999 - 2000	PhD dissertation compared snowshoe hare use in thinned and unthinnned lodgepole pine stands; Paper submitted to JWM for publication.
D. Smith (1984, unpublished)	- Habitat relationships - Movements & dispersal	Northern Rockies (Western Montana)	Radio-telemetry	23 months	5 lynx monitored
Ongoing					
K. Bunnell Brigham Young Univ.	Snow compaction effects on coyote distribution & feeding behavior Habitat relationships of snowshoe hares and red squirrels	Northern Rockies Primary study is the Uintah Mountains (Ashely NF, UT) w/additional data collected in the Bear River Range (UT), Island Park (ID) & Bighorn Mts (WY)	Aerial snow tracking, radio telemetry, ground tracking, scat analysis Pellet counts (hares) and midden counts (red squirrels) to assess population densities to micro & macro habitat conditions	2002 – 2004	Coyotes are accessing deep snow habitat via human induced snow compacted routes. Publication in Wildlife Society Bulletin 2006.
A. Fuller & D. Harrison U. of Maine	Habitat relationships Prey relationships Spatial use & movement patterns	Northeastern United States (Northwestern Maine)	Snow tracking & vegetation measurements	Jan - Mar 2002 & 2003	Evaluate sub-stand scale habitat selection and develop a model to determine which habitat variables best predict habitat selection.

Principal investigators	Focus	Location	Methods	Duration	Comments
C. McLaughlin Maine Dept. Inland Fisheries and Wildlife (MDIFW), J. Organ USFWS, G. Matula MDIFW, W. Jakubas MDIFW, C. Todd MDIFW	- Determine lynx population viability - Document mortality factors on lynx in NW Maine - Identify habitats used by lynx in NW Maine, including relationships with snowshoe hare distribution and abundance - Investigate relationships between lynx and sympatric predators in NW Maine - Test efficacy of survey methods to detect lynx	Northeastern United States (Musquacook Lakes region, Northwestern Maine)	Radio-telemetry; vegetation surveys, pellet counts, winter track surveys, hair-pad surveys, camera surveys	1999 - 2003	42 lynx captured; 28 monitored (>2400 locations) 15 kittens handled in 8 litters 8 den sites described; Coyotes, fisher, red fox, bobcat monitored. Study is located on privately owned commercial forestland.
P. Griffin L.S. Mills U. of Montana	- Model snowshoe hare population dynamics in a fragmented landscape	Northern Rockies (Seeley Lake, Montana)	Utilizing data collected from study listed above (Mills & Griffin)	1998 - 2003	Published in 2003 as article in *Species Conservation and Management:* Case Studies, Oxford University Press.
J. Koble, J. Squires et al. USFS, RMRS	- Human impacts (snow compacting activities) - Interspecific predator relationships	Northern Rockies (Northwestern Montana)	Radio-telemetry	2001 - 2003	Coyotes were resident within lynx home ranges and foraged mainly on carrion. Publication in press *J. Wildlife Management*
L.S. Mills & K. Hodges U. of Montana	- Habitat relationships of snowshoe hares - Sampling strategies for hare pellets - Effects of precommercial thinning on snowshoe hares	Northern Rockies (Lolo and Flathead NFs)	Mark & recapture, pellet counts & trapping	2000 - 2006	Ongoing time series for 13 stands, including 2 sites experimentally thinned in fall 2002.
L.S. Mills, K. Hodges, & E. Cheng (PhD student) U of Montana	- Relative abundance across park - Effect of 1988 burns on snowshoe hares	Yellowstone National Park, WY and MT	Mark and recapture, pellet counts	2002-2007	Densities and distribution across time have been low. Currently evaluating levels of genetic variation using tissue and fecal samples.

Principal investigators	Focus	Location	Methods	Duration	Comments
L.S. Mills & K. Hodges, U of Montana	- Distribution and abundance of acres - Evaluate fecal genotyping as a method for abundance estimation	Glacier National Park, MT	Live trapping, pellet counts, collection of ear punches and fecal pellets, genotyping at 10 micro-satellite locations	2005-2007	Mark-recapture, pellet counts and pellet collection for genotyping all concurrently examined on several intensive plots; pellet sampling for genotyping across park with emphasis on examining hare responses to burns
D. Murray U. of Idaho	- Methods of population estimation	Northern Rockies (Idaho Panhandle NFs)	Pellet counts	1999 - 2001	Estimate snowshoe hare densities among various vegetative stand conditions and elevation gradients
D. Murray U. of Idaho	- Movements & survival of snowshoe hares - Snowshoe hare foraging relationships	Northern Rockies (Priest Lake RD, IPNF's)	Radio-telemetry	1999 - 2002	Compare natural foraging conditions to natural plus supplemental forage (pellets). Nutritional and feeding requirements also assessed with snowshoe hares in controlled pens
D. Murray U. of Idaho	- Habitat relationships of snowshoe hares	Northern Rockies (Idaho Panhandle NFs)	Pellet counts	2000 - 2005	Compare responses of snowshoe hares to different thinning prescriptions. May run up to 10 years
T. Shenk CDOW	- Movements & dispersal Mortality assessments Prey relationships	Southern Rockies (Colorado)	Radio-telemetry & snow tracking	Began in 1999 & is ongoing	Focused on lynx reintroduced from Alaska & Canada
K. Shick & J. Goodburn U. of Montana	- Habitat relationships of snowshoe hares	Northern Rockies (Flathead NF, Montana)	Pellet counts, vegetative sampling	2001	Investigate snowshoe hare densities stands of varying structural and phase categories. M.S. thesis
J. Squires USFS, RMRS & others	- Habitat use & movements Prey relationships	Northern Rockies (Pioneer Mtns. & Beaverhead-Deerlodge NFs)	Radio-telemetry, snow tracking	2000 - 2003	No lynx detected or trapped to date. Potential prey species w/in area documented. Also gathering information on wolverine occurrence
J. Squires et al. USFS, RMRS,	- Demography & population dynamics - Community interactions - Habitat relationships - Movements & dispersal - Relationships with prey	Northern Rockies (Western Montana)	Radio-telemetry	Began in 1998 and is ongoing	Montana – 60+ lynx radioed (2002)

Principal investigators	Focus	Location	Methods	Duration	Comments
J. Squires et al. USFS, RMRS, T. Laurion –WG&F	- Demography & population dynamics - Community interactions - Habitat relationships - Movements & dispersal - Relationships with prey	Northern Rockies (Western Wyoming)	Radio-telemetry	Began in 1996 and is ongoing	Wyoming – 2 lynx radioed (1996-97)
M. Schwartz, J. Kolbe, K. McKelvey, L. Ruggiero, J. Squires USFS -RMRS J. Copeland IDFG	- Habitat relationships - Highway crossings - Human impacts (snowmobiles/winter recreation) - Interspecific predator competition - Movements & dispersal - Relationships with prey	Northern Rockies (Clearwater NF, Idaho; Lolo NF, Montana)	Radio-telemetry, snow tracking, highway mortality assessments	2001 - 2006	Includes gathering information on wolverines and other carnivores
Jennifer Vashon Main Dept of Inland Fisheries and Wildlife	- Determine lynx population status in NW Maine - Document recruitment and dispersal - Document mortality factors on lynx - Identify habitats used by lynx - Investigate relationships between lynx and sympatric predators - Test efficacy of survey methods to detect lynx	Northeastern U.S. (Musquacook Lakes region, NW Maine	Radio-telemetry, vegetation surveys, pellet counts, winter track surveys, hair pad surveys, camera stations	1999-2008	120 lynx captured; 41 monitored (>6,000 locations; 84 kittens handled in 30 litters; habitat at 21 den sites described; coyotes, fisher, red fox and bobcat monitored (1999-2003). Sampled hare pellet density on 18 sites (2002-2004) and winter track counts of hare (2001-2004). Analysis of lynx home ranges and movements and stand-level habitat use selection in progress. Study area is located on privately owned commercial forest land.
J. Weaver	- Habitat relationships of snowshoe hares	Northern Rockies (Kootenai NF, Montana)	Pellet counts	1996 - 2006	Evaluate abundance & trends of snowshoe hares in a range of stand types & structures. Evaluate snowshoe hare abundance & trends in control & paired precommercially thinned stands under a variety of PCT prescriptions.

Appendix G – Precommercial thinning examples for Alternatives D and F

1. Planted white pine - Alternatives D and F
Daylight thinning may be allowed in planted rust-resistant white pine if 80 percent of the snowshoe hare forage is retained. The maximum reduction in snowshoe hare forage and cover would be 20 percent. Allow local variations in spacing, depending on levels of rust-resistance and white pine stocking.

Researchers suggest the clearing radius be at least four feet and suggest the optimum competitive advantage is gained at ten feet. To keep the reduction in hare forage under 20 percent, a four-foot radius would allow daylight thinning around a maximum of 173 trees per acre; a 10-foot radius would protect at most 28 trees per acre. The trees selected to daylight would be the best performing planted, rust-resistant white pine. No thinning would be allowed outside specified clearing limits.

2. Promoting larch or ponderosa pine for large trees - Alternative D
Daylight thinning may be allowed to release larch or ponderosa pine to promote large trees that can survive fire in the future and be available to re-seed future stands. The maximum reduction in snowshoe hare forage and cover would be 20 percent.

The number of trees selected for daylight thinning would vary, depending on local fire history, desired snag levels, and management objectives. For example, to stay within the 20 percent loss limit, a clearing radius of 12 feet would result in protecting a maximum of 20 trees per acre. A clearing radius of 15 feet would protect at most 12 trees per acre. No thinning would be permitted outside the clearing limits.

3. Promoting lodgepole pine for old growth - Alternative D
Where the choice has been made to manage lodgepole pine to develop old growth characteristics, thinning would be allowed. One approach is found in John Shaw's dissertation, "Silvicultural Systems for Maintenance of Structure in a Forest Landscape" (Shaw 2002).

4. Where forage exceeds the range of historic conditions - Alternative D
Thinning may be allowed when a broadscale assessment has determined that forage conditions exceed the range of historic conditions. Generally, this is when current conditions exceed historic, or when a disturbance occurs over a large area and one similar condition is created. For example, if a 50,000-acre fire burns within an LAU or LAUs, precommercial thinning would be allowed in part, but not all, of the burned area, to create diversity.

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Appendix H — TEPS animals

Table H-1. Affects to Threatened, endangered, proposed or sensitive animals* whose habitat overlaps lynx habitat

	Montana NFs									Idaho NFs					Utah NF	Wyoming NFs		
	Beaverhead-Deerlodge	Bitterroot	Custer	Flathead	Gallatin	Helena	Kootenai	Lewis & Clark	Lolo	Clearwater	Idaho Panhandle	Nez Perce	Salmon-Challis	Targhee	Ashley	Bridger-Teton	Bighorn	Shoshone
Endangered																		
Mammals																		
Gray wolf	+/-			+/-		+/-	+/-	+/-	+/-		+/-		+/-	+/-		+/-		
Woodland caribou											0							
Fish																		
Bonytail chub															0	0		
Colorado pikeminnow															0	0		
Humpback chub															0	0		
Kendall Warm Springs dace																0		
Pallid sturgeon																0		
Razorback sucker															0	0		
Sockeye salmon													+/-					
White sturgeon							0				0							
Threatened																		
Mammals																		
Canada lynx			+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-			+/-		+/-		+/-
Gray wolf (10j rule)	+/-	+/-	+/-		+/-			+/-	+/-	+/-	+/-	+/-					+/-	+/-
Grizzly bear	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-		+/-		+/-
Birds																		
Bald eagle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fish																		
Bull trout	+/-	+/-		+/-		+/-	+/-		+/-	+/-	+/-	+/-	+/-					
Chinook salmon		+/-								+/-		+/-	+/-					
Steelhead trout		+/-								+/-		+/-	+/-					

	Montana NFs									Idaho NFs					Utah NF	Wyoming NFs		
	Beaverhead-Deerlodge	Bitterroot	Custer	Flathead	Gallatin	Helena	Kootenai	Lewis & Clark	Lolo	Clearwater	Idaho Panhandle	Nez Perce	Salmon-Challis	Targhee	Ashley	Bridger-Teton	Bighorn	Shoshone
Sensitive																		
Mammals																		
Fisher	+/-	+/-		+/-		+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-		+/-		
Fringed myotis										0	0	0					0	0
Great basin pocket mouse	0																	
Long-eared myotis			0															
Long-legged myotis			0															
Marten																	+/-	+/-
Northern bog lemming	0	0		0		0	0	0	0		0	0						
Pallid bat			0															
Pygmy rabbit	0												0					
River otter																		0
Spotted bat			0										0	0	0	0	0	0
Townsend's big-eared bat	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Water vole																	0	0
Wolverine	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Birds																		
Baird's sparrow			0															
Black-backed woodpecker	+	+	+	+	+	+	+	+	+	+	+	+						+
Black swift											0	0						
Black tern																		0
Blue-gray gnatcatcher			0															
Boreal owl													+/-	+/-	+/-	+/-	+/-	+/-
Brewer's sparrow																	0	0
Burrowing owl			0					0										0
Common loon				0			0		0		0			0		0		
Ferruginous hawk																		0
Flammulated owl	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Grasshopper sparrow																	0	0
Great gray owl													+/-	+/-	+/-	+/-		
Harlequin duck	0		0	0	0	0	0	0	0	0	0	0	0	0		0	0	0
Lewis' woodpecker																	0	0
(Sensitive, continued)																		
Loggerhead shrike			0														0	0

	Montana NFs									Idaho NFs					Utah NF	Wyoming NFs		
	Beaverhead-Deerlodge	Bitterroot	Custer	Flathead	Gallatin	Helena	Kootenai	Lewis & Clark	Lolo	Clearwater	Idaho Panhandle	Nez Perce	Salmon-Challis	Targhee	Ashley	Bridger-Teton	Bighorn	Shoshone
Long-billed curlew			0															0
Mountain plover																		0
Mountain quail												0						
Northern goshawk	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-
Northern harrier																	0	0
Olive-sided flycatcher																	+/-	+/-
Peregrine falcon	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0
Pygmy nuthatch										0	0	0						
Sage grouse	0		0					0					0	0	0	0	0	
Sage sparrow																	0	
Short-eared owl																	0	0
Three-toed woodpecker													+	+	+	+	+	+
Trumpter swan	0				0									0		0		0
White-headed woodpecker												+						
Yellow-billed cuckoo																		0
Fish																		
Artic grayling	+/-				+/-			+/-										
Bonneville cutthroat trout																+/-		
Burbot											+/-							
Colorado River cutthroat trout															+/-	+/-		
Interior redband trout							+/-			+/-	+/-	+/-						
Mountain sucker																	+/-	+/-
Northern redbelly dace			0															
Pacific lamprey		+/-								+/-		+/-						
Snake River spring/summer chinook		+/-								+/-		+/-						
Snake River cutthroat trout														+/-		+/-		
Sturgeon chub			0															
West slope cutthroat trout	+/-	+/-		+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-					
(Sensitive, continued)																		
Yellowstone cutthroat trout			+/-		+/-												+/-	+/-

	Montana NFs									Idaho NFs					Utah NF	Wyoming NFs		
	Beaverhead-Deerlodge	Bitterroot	Custer	Flathead	Gallatin	Helena	Kootenai	Lewis & Clark	Lolo	Clearwater	Idaho Panhandle	Nez Perce	Salmon-Challis	Targhee	Ashley	Bridger-Teton	Bighorn	Shoshone
Amphibians & reptiles																		
Boreal toad	+	+	+	+	+	+	+	+	+	+	+	+						+
Coeur d'Alene salamander		0					0		0	0	0	0						
Great Plains toad			0															
Greater short-horned lizard			0					0										
Milk snake			0															
Northern leopard frog	+	+	+	+	+	+	+	+	+								+	+
Plains spadefoot toad			0			0												
Ringneck snake										0		0						
Spotted frog													0	0	0	0	0	0
Western hognose snake			0															
Wood frog																	0	
Invertebrates																		
Hudsonian emerald																		0

*Species documented or suspected to be present in lynx habitat

0	=	Species not affected by the alternatives
-	=	Adverse (negative) effects possible from implementing Alternatives B, C, D, E or F
+	=	Beneficial (positive) effects possible from implementing Alternatives B, C, D, E or F
+/-	=	Either adverse or beneficial effects from implementing Alternatives B, C, D, E or F

Sources for evaluating habitat effects include:

Brainerd 1985	Martin et al. 1951	Sibley 2000	Whitaker 1996
Brocke et al. 1991	NaturServe Explorer, Version 1.6 2002	Smith 1984	Zielnski & Cucera 1995
Ehrlich et al. 1988	Nussbaum et al. 1983	USDA FS 2004a	USDA FS 2005
Johnsgard 1990	Schmidt & Gilbert 1978	USDA FS 2005b	USDA FS 2006

Appendix I — MIS species*

Table I-1. Affects to management indicator species whose habitat overlaps lynx habitat

	Montana NFs									Idaho NFs					Utah NF	Wyoming NFs		
	Beaverhead-Deerlodge	Bitterroot	Custer	Flathead	Gallatin	Helena	Kootenai	Lewis & Clark	Lolo	Clearwater	Idaho Panhandle	0ez Perce	Salmon-Challis	Targhee	Ashley	Bridger-Teton	Bighorn	Shoshone
Mammals																		
Beaver								+									+	
California bighorn sheep													0			0		0
Bighorn sheep			0		0	0												
Black bear								+/-										
Bobcat								+										
Canada lynx				+/-				+/-										
Elk	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-
Fisher				+/-				+/-				+/-		+/-		+/-		
Gray wolf	+/-		+/-	+/-			+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-				+/-
Grizzly bear	+/-		+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-				+/-
Marten	+/-	+/-		+/-		+/-				+/-	+/-	+/-	+/-	+/-		+/-		
Montane vole	0																	
Moose	+									+	+	+				+		+
Mountain goat	0						0	0					0					0
Mountain lion								0										
Mule deer	+/-			+/-		+/-		+/-					+/-		+/-	+/-		+/-
Northern bog lemming				0														
Red squirrel													+/-	+/-			+/-	
Townsend's big-eared bat				0										0				
Water shrew	0																	
Western jumping mouse	0																	
White-tailed deer			+/-	+/-			+/-	+/-		+/-	+/-							
Wolverine				+/-				+/-						+/-				
Woodland caribou											+/-							

	Montana NFs									Idaho NFs					Utah NF	Wyoming NFs		
	Beaverhead-Deerlodge	Bitterroot	Custer	Flathead	Gallatin	Helena	Kootenai	Lewis & Clark	Lolo	Clearwater	Idaho Panhandle	Oez Perce	Salmon-Challis	Targhee	Ashley	Bridger-Teton	Bighorn	Shoshone
Birds																		
Bald eagle	0		0	0	0	0	0	0	0	0	0	0	0	0				0
Belted kingfisher	0									0								
Black-backed woodpecker				0										+				
Blue grouse	+							+										+
Boreal owl				0										+/-	+/-	+/-	+/-	
Brewer's sparrow			0													0		0
Common loon				0										0		0		
Downy woodpecker														+				
Flammulated owl				0										0	0	0		
Golden eagle								0							0			
Great gray owl													+/-	+/-		+/-		
Hairy woodpecker	+					+								+				+
Harlequin duck				0										0				
Lincoln's sparrow															0			
Mountain bluebird													+					
Northern goshawk	+/-		+/-		+/-	+/-		+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-		+/-
Northern flicker														+				
Northern oriole			0															
Ovenbird			0															
Peregrine falcon	0		0	0			0	0	0	0		0	0	0				0
Pileated woodpecker	+/-	+/-		+/-		+/-	+/-		+/-	+/-	+/-	+/-	+/-					
Prairie falcon								0										
Pygmy nuthatch													0					
Red-breasted nuthatch																	+	
Red-napped sapsucker														+	+			
Ruby-crowned kinglet													+					
Ruffed grouse			0												0			0
Three-toed woodpecker	+							+						+	+	+	+	
Rufous-sided towhee			0															
Sage grouse															0			
Trumpeter swan	0													0				
(Birds, continued)																		
Vesper sparrow													0					

	Montana NFs									Idaho NFs					Utah NF	Wyoming NFs		
	Beaverhead-Deerlodge	Bitterroot	Custer	Flathead	Gallatin	Helena	Kootenai	Lewis & Clark	Lolo	Clearwater	Idaho Panhandle	0ez Perce	Salmon-Challis	Targhee	Ashley	Bridger-Teton	Bighorn	Shoshone
Warbling vireo															0			
White-crowned sparrow															0			
White-tailed ptarmigan															0			
Williamson's sapsucker														+				
Willow flycatcher	+																	
Yellow-belied sapsucker													+					
Yellow warbler			+										+					
Fish																		
Artic grayling	+/-																	
Bonneville cutthroat trout																+/-		
Brook trout								+/-										
Bull trout				+/-									+/-					
Chinook salmon										+/-		+/-	+/-					
Colorado River cutthroat trout																+/-		
Cutthroat trout	+/-	+/-	+/-			+/-		+/-			+/-	+/-	+/-		+/-			
Largemouth bass			0															
Rainbow trout								+/-			+/-		+/-			+/-	+/-	
Snake River cutthroat trout														+/-		+/-		
Steelhead trout										+/-		+/-	+/-					
Trout					+/-													+/-
Westslope cutthroat trout										+/-								
Yellowstone cutthroat trout				+/-										+/-				
Amphibians & reptiles																		
Spotted frog														0		0		
Invertebrates																		
Macro-invertebrates													+/-					

Appendix I Management Indicator Species

*MIS species were identified in the existing forest plans, as amended – or in the case of the Big Horn National Forest – as revised.
Species listed in *italics* are also listed as threatened, endangered, proposed, or sensitive species

0 = Species not affected by the alternatives
- = Habitat likely reduced (negative) by implementing Alternatives B, C, D or E
+ = Habitat likely improved (positive) by implementing Alternatives B, C, D or E
+/- = Some habitat reduced, some improved by implementing Alternatives B, C, D or E

Sources for evaluating habitat effects include:

Brainerd 1985
Brocke et al. 1991
Ehrlich et al. 1988
Johnsgard 1990
Martin et al. 1951
NaturServe Explorer, Version 1.6 2002
Nussbaum et al. 1983
Schmidt & Gilbert 1978
Sibley 2000
Smith 1984
USDA FS 2003
USDA FS 2004
USDA FS 2006
Whitaker 1996
Zielnski & Cucera 1995

Appendix J

TES plant species found in the planning area, by state

2006 Updated List

Scientific name	Common name	ID	MT	UT	WY
Adoxa moschatellina	Musk-root		X		
Agastache cusickii	Cusick's horse-mint		X		
Agoseris lackschewitzii	Pink agoseris				X
Allium acuminatum	Tapertip onion		X		
Allium parvum	Small onion		X		
Amerorchis rotundifolia	Round-leaved orchis		X		X
Andromeda polifolia		X			
Anemone lyallii	Lyall's wood-anemone				X
Anemone narcissiflora ssp zephyra	Zephyr windflower				X
Antennaria aromatica	Aromatic pussytoes				X
Antennaria densifolia	Dense-leaved antennaria		X		
Antennaria flagellaris	Stoloniferous pussytoes				X
Antennaria monocephala	Single-head pussytoes				X
Aquilegia brevistyla	Short-styled columbine		X		
Aquilegia formosa var formosa	Crimson columbine		X		X
Aquilegia grahamii	Graham's columbine			X	
Arabis falcatoria	Rockcress			X	
Arabis fecunda	Sapphire rockcress		X		
Arnica lonchophylla	Northern arnica				X
Artemisia campestris var. petiolata				X	
Artemisia norvegica var piceetorum	Spruce wormwood			X	
Asclepias ovalifolia			X		
Asplenium trichomanes-ramosum	Green spleenwort	X			X
Aster junciformis		X			
Astragalus anserinus	Milkvetch			X	
Astragalus desereticus	Milkvetch			X	
Astragalus equisolensis	Horseshoe milkvetch			X	
Astragalus jejunus var. jejunus	Milkvetch			X	
Astragalus lackschewitzii	Lackschewitz's milkvetch		X		
Astragalus microcystis		X			
Astragalus paysonii	Payson's milkvetch	X			X
Astragalus scaphoides	Milkvetch		X		
Astragalus shultziorum	Shultz's milkvetch				X
Athysanus pusillus	Sandweed		X		
Balsamorhiza macrophylla	Large-leafed balsamroot		X		
Bidens beckii	Beck water-marigold		X		
Betula pumila		X			
Blechnum spicant	Deer-fern	X			

Scientific name	Common name	ID	MT	UT	WY
Botrychium ascendens	Upward-lobed moonwort	X	X		
Botrychium crenulatum	Wavy moonwort	X	X		
Botrychium echo	Reflected grapefern			X	
Botrychium hesperium	Western moonwort		X		
Botrychium lanceolatum var lanceolatum	Lance-leaved moonwort	X			
Botrychium lineare	Slender moonwort	X			
Botrychium minganense	Mingan Island moonwort	X			X
Botrychium montanum	Mountain moonwort	X			
Botrychium multifidum	Leathery grapefern				X
Botrychium paradoxum	Peculiar moonwort	X	X	X	
Botrychium pendunculosum	Stalked moonwort	X	X		
Botrychium pinnatum	Northern moonwort	X			
Botrychium simplex	Least moonwort	X			
Botrychium virginianum	Rattlesnake fern				X
Braya glabella	Arctic braya				X
Brasenia schreberi			X		
Bryoria subdivergens			X		
Buxbaumia aphylla	Bug-on-a-stick	X			
Buxbaumia viridis	Leafless bug-on-a-stick	X			
Calochortus nitidus	Mariposa lily	X			
Cardamine constancei	Constance's bittercress	X			
Carex amplifolia	Big-leaf sedge		X		
Carex buxbaumii	Buxbaum's sedge	x			
Carex chordorrhiza	Creeping sedge	X	X		
Carex comosa	Sedge	X			
Carex deweyana var bolanderi	Bolander's sedge				X
Carex diandra	Lesser panicled sedge				X
Carex flava	Yellow sedge	x			
Carex idahoa	Idaho sedge	X	X		
Carex lacustris	Sedge		X		
Carex leptalea	Bristly-stalk sedge	X		X	X
Carex limosa	Mud sedge				X
Carex livida	Pale sedge	X			X
Carex luzulina var atropurpurea	Black and purple sedge				X
Carex microglochin	False uncinia sedge				X
Carex paupercula	Poor sedge	X			
Carex prairea	Prairie sedge		X		
Carex rostrata	Beaked sedge		X		
Carex vaginata	Sedge		X		
Castilleja covilleana	Coville Indian paintbrush		X		
Castilleja crista-galli	Cock's comb paintbrush				X
Castilleja nivea	Snow paintbrush				X

Scientific name	Common name	ID	MT	UT	WY
Cetraria subalpina			X		
Cicuta bulbifera	Bulbet-bearing water hemlock	X			X
Cirsium eatonii var murdockii	Murdock's thistle			X	
Clarkia rhomboidea	Common clarkia		X		
Cladonia andereggii		X			
Claytonia arenicola	Sand springbeauty		X		
Collema curtisporum	Short-spored jelly lichen	X	X		
Cornus nuttallii	Pacific dogwood	X			
Corydalis sempervirens	Pale corydalis		X		
Cryptogramma stelleri	Fragile rockbrake				X
Cymopterus evertii	Evert's waterparsnip				X
Cypripedium fasciculatum	Clustered lady's slipper	X	X	X	
Cypripedium montanum	Lady's slipper				X
Cypripedium parviflorum	Small yellow lady's slipper		X		X
Cypripedium passerinum	Sparrow's-egg lady's slipper		X		
Dasynotus daubernmirei	Daubenmire's dasynotus	X			
Deschampsia danthonioides	Annual hairgrass				X
Descurainia torulosa	Wyoming tansymustard				X
Douglasia idahoensis	Douglasia	X			
Draba borealis	Boreal draba				X
Draba brachstylis	Shortstyle draba			X	
Draba crassa	Thick-leaf whitlow-grass				X
Draba fladenizensis var pattersonii	White arctic whitlow-grass				X
Draba globosa	Rockcress draba or Beavertip draba		X	X	X
Draba juniperina	Fewseed draba			X	
Drosera anglica	English sundew		X		X
Drosera intermedia	Spoon-leaved sundew	X			
Drosera linearis	Linear-leaved sundew		X		
Dryopteris cristata	Buckler fern	X	X		
Dryopteris expansa	Spreading woodfern				X
Eleocharis rostellata	Beaked spikerush		X		
Elymus innovatus	Wild-rye		X		
Epilobium palustre	Swamp willow-weed	X			
Epipactis gigantea	Giant helleborine	X	X		
Equisetum sylvaticum	Woodland horsetail				X
Ericameria discoidea var linearis	Narrowleaf goldenweed				X
Erigeron asperugineus	Idaho fleabane		X		
Erigeron evermannii	Evermann fleabane		X		
Erigeron lackschewitzii	Lackschewitz' fleabane		X		
Erigeron untermannii	Indian Canyon fleabane			X	
Eriogonum brevicaule	Buckwheat			X	

Scientific name	Common name	ID	MT	UT	WY
Eriophorum chamissonis	Russet cottongrass				X
Eriophorum gracile	Slender cottongrass		X		X
Eriophorum viridicarinatum	Green keeled cottongrass	X			
Eritrichum howardii	Howard forget-me-not				X
Eupatorium occidentale	Western boneset		X		
Festuca hallii	Hall's fescue				X
Gaultheria hispidula	Creeping snowberry	X			
Gentianopsis macounii	Gentian		X		
Gentianopsis simplex	Hiker's gentian		X		
Glossopetalon nevadense			X		
Goodyera repens	Northern rattlesnake-plantain		X		
Grimmia brittoniae		X	X		
Grindelia howellii	Howell's gum-weed	X	X		
Halimolobos perplexa var lemhiensis	Puzzling rockcress	X	X		
Haplopappus aberrans	Goldenweed		X		
Haplopappus carthamoides var subsquarrosus	Beartooth large-flowered goldenweed		X		
Haplopappus hirtus	Goldenweed	X			
Haplopappus insecticruris	Bug-leg goldenweed	X			
Haplopappus macronema var macronema	Discoid goldenweed		X		
Heteranthera dubia			X		
Heterocodon rariflorum	Western pearl-flower		X		
Hookeria lucens	Clear moss	X			
Howellia aquatilis	Water howellia		X		
Hypericum majus		X			
Idahoa scapigera			X		
Ipomopsis crebrifolia	Compact gilia		X		X
Iris versicolor	Blueflag	X			
Juncus hallii	Hall's rush		X		
Kalmia polifolia	Pale laurel		X		
Kelloggia galioides	Milk kelloggia				X
Kobresia sibirica	Siberian kobresia				X
Kobresia simpliciuscula	Simple bog sedge		X	X	X
Lathyrus bijugatus	Sweet pea		X		
Lepidium barnebyanum	Pepperweed			X	
Lepidium integrifolium var integrifolium	Entire leaved pepperweed			X	
Lesquerella carinata var carinata	Keeled bladderpod				X
Lesquerella fremontii	Fremont's bladderpod				X
Lesquerella humilis	Bitterroot bladderpod		X		
Lesquerella paysonii	Payson's bladderpod		X		X
Lesquerella pulchella	Beautiful bladderpod		X		

Scientific name	Common name	ID	MT	UT	WY
Liparis loeselii	Yellow widelip orchid		X		
Lomatium geyeri	Geyer's biscuitroot		X		
Lomatium salmoniflorum	Desert parsley	X			
Lonicera caerulea var cauriana	Western honeysuckle				X
Lycopodiella inundata	Northern bog clubmoss	X	X		
Lycopodium dendroideum	Groundpine clubmoss	X	X		
Lycopodium lagopus	Clubmoss		X		
Marsilea vestita var oligospora	Pepperwort				X
Meesia longiseta	Messia	X			
Meesia triquetra			X		
Mentzelia goodrichii	Goodrich's blazingstar			X	
Mertensia bella	Oregon bluebells		X		
Mimulus ampliatus	Spacious monkeyflower	X			
Mimulus alsinoides	Monkeyflower	X			
Mimulus breviflorus	Monkeyflower		X		
Mimulus nanus	Monkeyflower		X		
Mimulus patulus	Stalk-leaved monkeyflower	X	X		
Mimulus primuloides	Primrose monkeyflower		X		
Mirabilis macfarlanei	MacFarlane's four-o'clock	X			
Monardella odoratissima var glauca	Mountain wild-mint				X
Najas guadalupensis	Southern naiad				X
Nodobryoria subdivergens			X		
Oenothera flava var acutissima	Flaming Gorge evening-primrose			X	
Ophioglossum pusillum	Adder's tongue		X		
Orobanche corymbosa var corymbosa	Flat-top broomrape				X
Orogenia fusiformis	Tapered-root orogenia		X		
Oxytropis podocarpa	Stalked-pod crazyweed		X		
Paeonia brownii	Brown's peony				X
Papaver kluanense	Alpine poppy				X
Papaver radicatum var. pygmaeum	Poppy			X	
Parnassia kotzebuei	Kotzebue's grass of Parnassus				X
Parrya nudicaulis	Naked-stemmed parrya				X
Parrya rydbergii	Naked stem wallflower			X	
Pedicularis contorta var ctenophora	Pink coil-beaked lousewort				X
Pellaea suksdorfiana	Smooth cliff-brake				X
Penstemon absarokensis	Absaroka beardtongue				X
Penstemon acaulis var. acaulis	Beardtongue			X	
Penstemon grahamii	Graham's beardtongue			X	
Penstemon caryi	Cary's beardtongue				X
Penstemon idahoensis	Beardtongue			X	
Penstemon lemhiensis	Lemhi beardtongue	X	X		

Scientific name	Common name	ID	MT	UT	WY
Penstemon payettensis	Payette beardtongue		X		
Penstemon scariosus var. albifluvis	Beardtongue			X	
Penstemon uintahensis	Uinta Mountain beardtongue			X	
Pentagramma triangularis ssp. triangularis		X			
Petasites frigidus var. palmatus	Coltsfoot	X	X		
Phacelia argillacea				X	
Phegopteris connectilis	Northern beechfern	X	X		
Phlox diffusa ssp scleranthifolia	Diffuse phlox				X
Phlox kelseyi var missoulensis	Missoula phlox		X		
Physaria didymocarpa var. ianata	Twinpod				X
Polygonum douglasii ssp austinae	Austin's knotweed		X		
Polypodium glycyrrhiza		X			
Polystichum braunii	Braun's sword-fern	X			
Potamogeton friesii	Frie's pondweed				X
Potamogeton obtusifolius	Blunt-leaved pondweed		X		
Potamogeton praelongus	White-stemmed pondweed				X
Potentilla cottamii				X	
Potentilla palustris	Marsh cinquefoil			X	
Potentilla quinquefolia	Five-leaf cinquefoil		X		
Potentilla subjuga	Twinleaf cinquefoil				X
Primula alcalina	Alkali primrose	X	X		
Primula egaliksensis	Greenland primrose				X
Primula incana	Silvery primrose		X	X	
Primula maguirei	Primrose			X	
Psilocarphus brevissius			X		
Pyrrocoma carthamoides var subsquarrosa	Absaroka goldenweed				X
Pyrrocoma clementis var villosa	Hairy tranquil goldenweed				X
Pyrrocoma integrifolia	Manysted goldenweed				X
Ranunculus gelidus	Timberline buttercup				X
Ranunculus jovis	Jove's buttercup		X		
Ranunculus karelinii	Ice cold buttercup				X
Rhizomnium nudum		X			
Rhynchospora alba		X			
Rubus arcticus var. acaulis	Dwarf raspberry				X
Salix barrattiana	Barratt's willow		X		X
Salix candida	Hoary willow	X			X
Salix myrtillifolia	Blueberry willow				X
Salix pedicellaris	Willow	X			
Saussurea weberi	Weber's saw-wort		X		X
Saxifraga tempestiva	Storm saxifrage		X		
Scheuchzeria palustris	Pod grass	X	X		

Scientific name	Common name	ID	MT	UT	WY
Schoenocrambe argillacea	Clay reed-mustard				
Schoenocrambe suffrutescens	Shrubby reed-mustard			X	
Schoenoplectus subterminalis		X			
Sclerocactus glaucus	Uinta basin hookless cactus			X	
Scirpus cespitosus	Tufted club-rush		X		
Scripus hudsonianus	Hudson's Bay bullrush	X			
Scirpus subterminalis	Water bulrush		X		
Scorpidium scorpioides			X		
Selaginella selaginoides	Low spike-moss				X
Shoshonea pulvinata	Shoshone carrot		X		X
Silene repens var australis	Creeping campion				X
Silene spaldingii	Spalding's catchfly	X			
Sparganium natans	Small bur-reed				X
Sphagnum mendocinum	Peatmoss	X			
Spiranthes diluvialis	Ute ladies' tresses	X			
Stephanomeria fluminea	Teton wire-lettuce				X
Streptopus streptopoides var brevipes	Kruhsea twisted stalk	X			
Sullivantia hapemanii var hapemanii	Hapeman's sullivantia				X
Symphyotrichum mollis	Soft aster				X
Synthyris platycarpa		X			
Thalictrum alpinum	Alpine meadowrue		X		
Thelypteris nevadensis		X			
Townsendia condensata var anomala	North Fork Easter daisy				X
Townsendia montana var caelilinensis	Mountain townsendia			X	
Triantha occidentaliss ssp. brevistyla		X			
Trichophorum pumilum	Pygmy bulrush				X
Trientalis arctica	Northern starflower	X			
Trifolium eriocephalum ssp arcuatum	Wooly-head clover		X		
Trifolium gymnocarpon	Hollyleaf clover		X		
Trifolium douglasii	Douglas clover	X			
Trifolium plumosum var. amplifolium	Clover	X			
Triteleia grandiflora	Large-flower triteleia				X
Utricularia intermedia	Flat-leaved bladderwort		X		
Utricularia minor	Lesser bladderwort				X
Vaccinium oxycoccos	Bog cranberry	X			
Veratrum californicum	California false-hellebore		X		
Viburnum edule	Squashberry				X
Viola lithion	Violet			X	
Viola renifolia var brainerdii	Kidney-leaf white violet				X
Waldsteninia idahohensis	Idaho strawberry	X	X		
Xerophyllum tenax	Western beargrass				X
Totals	**283**	**84**	**113**	**39**	**94**

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Appendix K – Analysis data by National Forest

Table K-1. Acres* of precommercial thinning possible during next decade

	Scheduled in lynx habitat	Scheduled outside lynx habitat	Total scheduled
NATIONAL FOREST			
Idaho			
Clearwater	5,510	7,970	13,480
Idaho Panhandle	80,890	27,990	108,880
Nez Perce	12,370	16,750	29,120
Salmon-Challis	22,000	8,500	30,500
Targhee	36,800	8,200	45,000
Montana			
Beaverhead-Deerlodge	21,280	4,960	26,240
Bitterroot	510	17,890	18,400
Custer	1,010	10,840	11,850
Flathead	49,540	2,300	51,840
Gallatin	26,300	5,000	31,300
Helena	3,830	0	3,830
Kootenai	73,260	50,770	124,030
Lewis & Clark	7,410	720	8,130
Lolo	30,160	9,530	39,690
Utah			
Ashley	7,710	870	8,580
Wyoming			
Bighorn	3,000	8,000	11,000
Bridger-Teton	9,500	0	9,500
Shoshone	4,250	600	4,850
TOTAL	395,330	180,890	576,220

*Acres are estimates rounded to the nearest ten and could change due to changing needs.

Table K-2. Acres* of precommercial thinning by alternative

	Alt. A Total In lynx / Out lynx	Alt. B Total In lynx / Out lynx	Alts C & E Total In lynx / Out lynx	Alt. D Total In lynx / Out lynx	Alt. F Total In lynx / Out lynx
NATIONAL FOREST					
Idaho					
Clearwater	13,480 5,510 / 7,970	7,970 0 / 7,970	7,970 0 / 7,970	11,550 3,580 / 7,970	9,900 1,930 / 7,970
Idaho Panhandle	108,880 80,890 / 27,990	28,150 160 / 27,990	28,190 200 / 27,990	101,680 73,690 / 27,990	68,270 40,280 / 27,990
Nez Perce	29,120 12,370 / 16,750	16,870 120 / 16,750	16,870 120 / 16,750	17,110 360 / 16,750	16,870 120 / 16,750
Salmon-Challis	30,500 22,000 / 8,500	8,720 220/ 8,500	8,720 220 / 8,500	14,520 6,020 / 8,500	10,120 1,620 / 8,500
Targhee	45,000 36,800 / 8,200	8,570 370 / 8,200	8,570 370 / 8,200	9,070 870 / 8,200	9,070 870 / 8,200
Montana					
Beaverhead-Deerlodge	26,240 21,280 / 4,960	4,960 0 / 4,960	5,000 40 / 4,960	26,240 21,280 / 4,960	5,220 260 / 4,960
Bitterroot	18,400 510 / 17,890	17,890 0 / 17,890	17,940 50 / 17,890	18,040 150 / 17,890	17,940 50 / 17,890
Custer	11,850 1,010 / 10,840	10,840 0 / 10,840	10,840 0 / 10,840	11,840 1,000 / 10,840	11,840 1,000 / 10,840
Flathead	51,840 49,540 / 2,300	2,800 500 / 2,300	3,020 720 / 2,300	35,960 33,660 / 2,300	3,760 1,460 / 2,300
Gallatin	31,300 26,300 / 5,000	5,260 260 / 5,000	5,280 280 / 5,000	6,310 1,310 / 5,000	6,310 1,310 / 5,000
Helena	3,830 3,830 / 0	0 0 / 0	40 40 / 0	920 920 / 0	730 730 / 0
Kootenai	124,030 73,260 / 50,770	50,770 0 / 50,770	51,010 240 / 50,770	119,240 68,470 / 50,770	64,290 13,520 / 50,770
Lewis & Clark	8,130 7,410 / 720	720 0/ 7 20	740 20 / 720	740 20 / 720	740 20 / 720
Lolo	39,690 30,160 / 9,530	9,830 300 / 9,530	10,830 1,300 / 9,530	21,680 12,150 / 9,530	11,730 2,200 / 9,530
Utah					
Ashley	8,580 7,710 / 870	1,110 230 / 870	1,100 230 / 870	1,880 1,010 / 870	1,490 620 / 870
Wyoming					
Bighorn	11,000 3,000 / 8,000	8,030 30 / 8,000	8,030 30 / 8,000	8,360 360 / 8,000	8,120 120 / 8,000
Bridger-Teton	9,500 9,500 / 0	0 0 / 0	0 0 / 0	9,500 9,500 / 0	1,000 1,000 / 0
Shoshone	4,850 4,250 / 600	600 0 / 600	600 0 / 600	2,730 2,130 / 600	600 0 / 600
TOTAL	576,220 395,330/180,890	183,080 2,190 / 180,890	184,750 3,860 / 180,890	417,370 236,480/180,890	248,000 67,110/180,890

*Acres are estimates rounded to the nearest ten and could change due to changing needs.

Table K-3. Acres of precommercial thinning possible during next decade for research, genetic testing and fire-defensible space

	Research PCT		Genetic testing PCT		Defensible space PCT	
	In lynx habitat	Outside habitat	In lynx habitat	Outside habitat	In lynx habitat	Outside habitat
NATIONAL FOREST						
Idaho						
Clearwater	0	0	0	100	0	0
Idaho Panhandle	0	20	40	50	160	1,120
Nez Perce	0	0	0	60	120	170
Salmon-Challis	0	0	0	0	220	90
Targhee	0	0	0	0	370	410
Montana						
Beaverhead-Deerlodge	0	0	40	0	0	0
Bitterroot	50	50	0	50	0	360
Custer	0	0	0	0	0	220
Flathead	180	0	40	0	500	20
Gallatin	20	0	0	0	260	0
Helena	0	0	40	0	0	0
Kootenai	200	0	40	40	0	1,520
Lewis & Clark	0	0	20	0	0	0
Lolo	1,000	0	0	20	300	100
Utah						
Ashley	0	0	0	0	230	0
Wyoming						
Bighorn	0	10	0	0	30	160
Bridger-Teton	0	0	0	0	0	0
Shoshone	0	0	0	0	0	0
TOTAL	1,450	80	220	320	2,190	4,170

*Acres are estimates rounded to the nearest ten, and could change based on changing needs.

Table K-4. Acres* of precommercial thinning possible during next decade for planted white pine, whitebark pine and quaking aspen

	Planted white pine		Whitebark pine		Quaking aspen	
	In lynx habitat	Outside habitat	In lynx habitat	Outside habitat	In lynx habitat	Outside habitat
NATIONAL FOREST						
Idaho						
Clearwater	1,930	3,990	0	0	0	0
Idaho Panhandle	36,400	10,920	2,950	0	730	0
Nez Perce	0	0	0	250	0	0
Salmon-Challis	0	0	300	0	1100	430
Targhee	0	0	500	0	0	0
Montana						
Beaverhead-Deerlodge	0	0	0	0	220	50
Bitterroot	0	0	0	0	0	0
Custer	0	0	1,000	0	0	220
Flathead	740	30	0	0	0	0
Gallatin	0	0	1,000	0	30	0
Helena	0	0	500	0	190	0
Kootenai	11,720	4,570	1,560	0	0	2,030
Lewis & Clark	0	0	0	0	0	0
Lolo	300	100	300	0	300	100
Utah						
Ashley	0	0	0	0	390	0
Wyoming						
Bighorn	0	0	0	0	90	240
Bridger-Teton	0	0	1,000	0	0	0
Shoshone	0	0	0	0	0	0
TOTAL	51,090	19,610	9,110	250	3,050	3,070

*Acres are estimates rounded to the nearest ten, and could change based on changing needs.

Table K-5. Acres* of precommercial thinning possible during next decade for ponderosa pine, western larch, lodgepole pine

	Ponderosa pine		Western larch		Lodgepole pine	
	In lynx habitat	Outside habitat	In lynx habitat	Outside habitat	In lynx habitat	Outside habitat
NATIONAL FOREST						
Idaho						
Clearwater	0	800	1,650	1,590	0	0
Idaho Panhandle	1,700	3,360	31,550	8,960	160	60
Nez Perce	120	1,680	120	1,340	0	0
Salmon-Challis	2,200	850	0	0	2,200	850
Targhee	0	0	0	0	0	0
Montana						
Beaverhead-Deerlodge	0	100	0	0	21,020	4,810
Bitterroot	100	13,600	0	1,070	0	0
Custer	0	10,400	0	0	0	0
Flathead	4,950	1,150	27,250	920	0	0
Gallatin	0	200	0	0	0	0
Helena	0	0	190	0	0	0
Kootenai	2,200	12,160	52,750	30,450	0	0
Lewis & Clark	0	180	0	0	0	0
Lolo	300	2,860	9,650	950	0	0
Utah						
Ashley	0	870	0	0	390	0
Wyoming						
Bighorn	90	240	0	0	150	400
Bridger-Teton	0	0	0	0	8,500	0
Shoshone	0	0	0	0	2,130	300
TOTAL	11,660	48,450	123,160	45,280	34,550	6,420

*Acres are estimates rounded to the nearest ten, and could change based on changing needs.

Table K-6. Acres* of precommercial thinning by alternative during next decade, full funding compared to historic average funding

	Alternative A		Alternative B		Alts C & E		Alternative D		Alternative F	
	Full funding	Historic average	Full funding	Historic average	Full funding	Historic average	Full funding	Historic average	Full funding	Historic average
NATIONAL FOREST										
Idaho										
Clearwater	13,480	4,310	7,970	2,550	7,970	2,550	11,550	3,670	9,900	3,170
Idaho Panhandle	108,880	34,840	28,150	9,010	28,190	9,020	101,680	32,540	68,270	21,850
Nez Perce	29,120	9,320	16,870	5,400	16,870	5,400	17,110	5,480	16,870	5,400
Salmon-Challis - R4	30,500	11,290	8,720	3,230	8,720	3,230	14,520	5,370	10,120	3,740
Targhee -R4	45,000	16,650	8,570	3,170	8,570	3,170	9,070	3,360	9,070	3,360
Montana										
Beaverhead-Deerlodge	26,240	8,400	4,960	1,590	5,000	1,600	26,240	8,400	5,220	1,670
Bitterroot	18,400	5,890	17,890	5,730	17,940	5,740	18,040	5,770	17,940	5,740
Custer	11,850	3,790	10,840	3,470	10,840	3,470	11,840	3,790	11,840	3,790
Flathead	51,840	16,590	2,800	900	3,020	970	35,960	11,510	3,760	1,200
Gallatin	31,300	10,020	5,260	1,680	5,280	1,690	6,310	2,020	6,310	2,020
Helena	3,830	1,230	0	0	40	10	920	290	730	230
Kootenai	124,030	39,690	50,770	16,250	51,010	16,320	119,240	38,160	64,290	20,570
Lewis & Clark	8,130	2,600	720	230	740	240	740	240	740	240
Lolo	39,690	12,700	9,830	3,150	10,830	3,470	21,680	6,940	11,730	3,750
Utah										
Ashley –R4	8,580	3,180	1,100	410	1,100	410	1,880	700	1,490	550
Wyoming										
Bighorn-R2	11,000	6,600	8,030	4,820	8,030	4,820	8,360	5,020	8,120	4,870
Bridger-Teton-R4	9,500	3,520	0	0	0	0	9,500	3,520	1,000	370
Shoshone	4,850	2,910	600	360	600	360	2,730	1,640	600	360
TOTAL	576,220	193,530	183,080	61,950	184,750	62,470	417,370	148,420	248,000	82,880

*Acres are estimates rounded to the nearest ten, and could change based on changing needs.

Before Canada lynx was listed as a threatened species, Congress funded units in the amendment area to do about 20,000 acres of precommercial thinning a year. Amounts varied somewhat from year to year. FS Regions 1 and 4 both had many acres scheduled to be thinned, but were funded to do only about 30 to 40 percent. FS Region 2 had a smaller program and was funded to do about 60 percent.

	FS R1	FS R2	FS R4	Total/average
1994-1998 average acres funded	15,000	1,000	3,600	19,600
Percent funded	32%	60%	37%	34%

Table K-7. Grazing allotments

				Active allotments with lynx habitat:			
	Number of allotments	With lynx habitat	Active with lynx habitat	Less than 25 percent	From 25 to 50 percent	More than 50 percent	With similar direction‡
NATIONAL FOREST							
Idaho							
Clearwater	17	0	0	0	0	0	0
Idaho Panhandle	11	9	8	1	2	5	6
Nez Perce	29	15	12	3	3	6	12
Salmon-Challis	114	85	85	49	27	9	85
Targhee	145	100	86	8	24	54	86
Montana							
Beaverhead-Deerlodge	318	318	315	91	80	144	315
Bitterroot	20	19	15	9	2	4	15
Custer	133	24	24	13	4	7	24
Flathead	20	19	11	0	3	8	11
Gallatin	98	98	94	20	36	38	0
Helena	88	88	75	27	30	18	25
Kootenai	44	27	17	7	3	7	17
Lewis and Clark	269	146	143	21	11	111	73
Lolo	36	18	13	2	5	6	13
Utah							
Ashley	68	68	51	6	19	26	51
Wyoming							
Bighorn	106	61	59	13	23	23	59
Bridger-Teton	278	278	236	0	236	0	236
Shoshone	84	47	45	21	14	10	10
TOTAL	1,878	1,420	1,289	291	522	476	1,045

‡ *Similar direction* includes plan standards for riparian habitat protection or other management direction for grazing.

Table K-8. Miles of designated or groomed winter routes and acres of designated play areas

	All groomed or designated routes, in miles	Inside lynx habitat			
		Groomed or designated routes, in miles	Average designated routes groomed/year, in miles	Designated routes that could be groomed, in miles	Designated play areas (Number) & acres
NATIONAL FOREST					
Idaho					
Clearwater	1,025	500	425	75	0
Idaho Panhandle	1,450	975	475	500	0
Nez Perce	2,275	1,075	275	775	0
Salmon-Challis	1,500	1,125	225	900	0
Targhee	1,000	400	400	0	0
Montana					
Beaverhead-Deerlodge	1,000	575	275	300	0
Bitterroot	250	100	25	75	0
Custer	50	25	0	25	0
Flathead	175	175	175	0	0
Gallatin	425	350	305	50	0
Helena	375	275	200	75	(2) for 3,750
Kootenai	425	250	175	75	0
Lewis & Clark	825	600	225	400	(2) for 300
Lolo	700	375	300	75	0
Wyoming					
Bighorn	425	50	25	25	0
Bridger-Teton	850	850	750	100	0
Shoshone	500	150	100	50	0
Utah					
Ashley	125	125	120	0	0
TOTAL	13,375	7,975	4,475 (56%)	3,500 (44%)	(4) for 4,050

The table contains estimated miles for each unit rounded to the nearest 25, as of January 2004. The baseline miles need to be established by each unit once a decision is made. The lynx amendment is not setting these as the baseline figures. These data may be updated as each unit conducts further site specific analysis to map the baseline, and for travel planning.

Table K-9. Recreation special use permits (SUPs) and agreements

NATIONAL FOREST	Recreation SUPs and agreements	Winter recreation SUPs and agreements	Winter recreation SUPs and agreements in lynx habitat
Idaho			
Clearwater	37	6	3
Idaho Panhandle	195	25	24
Nez Perce	64	17	15
Salmon-Challis	114	14	14
Targhee	325	24	21
Montana			
Beaverhead-Deerlodge	28	4	4
Bitterroot	211	7	7
Custer	17	0	0
Flathead	201	8	8
Gallatin	376	30	30
Helena	58	8	6
Kootenai	61	19	19
Lewis and Clark	21	21	21
Lolo	141	24	20
Utah			
Ashley	24	2	2
Wyoming			
Bighorn	343	86	85
Bridger-Teton	227	39	39
Shoshone	279	25	20
TOTAL	2,722	359	338

Table K-10. Cross-country and downhill ski areas operating under special use permit

		Inside lynx habitat			
	Ski areas	Number	Acres	Planning expansion	New areas planned
NATIONAL FOREST					
Idaho					
Clearwater	0	0	0	0	0
Idaho Panhandle †	2	0	0	1	0
Nez Perce	1	0	0	0	0
Salmon-Challis ‡	1	1	1,401	1	0
Targhee	2	2	974	1	0
Montana					
Beaverhead-Deerlodge	2	2	1,999	1	0
Bitterroot ‡	0	0	0	0	0
Custer	1	1	1,288	1	0
Flathead	6	5	3,749	1	0
Gallatin	2	2	956	1	0
Helena	3	2	320	0	0
Kootenai	3	1	2,640	1	1
Lewis & Clark	3	3	1,498	1	0
Lolo †	3	2	1,412	1	0
Wyoming					
Bighorn	6	1	400	0	0
Bridger-Teton	5	5	4,620	0	0
Shoshone	10	1	2	0	0
Utah					
Ashley	0	0	0	0	0
TOTAL	50	28	21,259	10	1

† The Idaho Panhandle and Lolo National Forests both have parts of the Lookout Pass ski area within their administrative boundaries. On this table it is listed under the Lolo in Montana.

‡ The Salmon-Challis and Bitterroot National Forests both have parts of the Lost Trail ski area within their administrative boundaries. On this table it is listed under the Salmon-Challis NF in Idaho.

Table K-11. Mining operations and wells in lynx habitat

	Wells in last 10 years		Foreseeable wells or pads*	Minerals operations	
	Drilled	Outside habitat		Number	Name of major operations
NATIONAL FOREST					
Idaho					
Clearwater	0	0	0	0	-
Idaho Panhandle	0	0	0	0	-
Nez Perce	0	0	0	0	-
Salmon-Challis	0	0	0	0	-
Targhee	0	0	0	0	-
Montana					
Beaverhead-Deerlodge	0	0	4	2	Beal & Golden Jubilee
Bitterroot	0	0	0	0	-
Custer	2*	0	2	1	Stillwater
Flathead	0	0	0	0	-
Gallatin	0	0	0	1	East Boulder
Helena	1*		2	2 to 3	-
Kootenai	0	0	0	1	Troy
Lewis and Clark	0	0	2	0	-
Lolo	0	0	0	1 to 5	-
Utah					
Ashley	0	0	3	1	-
Wyoming					
Bighorn	0	0	1	0	-
Bridger-Teton	0	Several	24	0	-
Shoshone	0	1	1	0	-
TOTAL	1	3+	39	9 to 14	-

*Pads with multiple wells on the same location are counted as "1 well or pad" since the disturbance is comparable to a single well.

**One well on the Helena NFis on private land within the National Forest boundary has been plugged and abandoned. The two wells on the Custer NF are also plugged and abandoned.

Table K-12. Miles of forest roads in lynx habitat, part 1

			Paved 2 or more lanes		Environmental paving	
	Maintenance level 2	Maintenance levels 3 to 5	Paved last 10 years	Planned next 10 years	Paved last 5 years	Planned next 5 years
NATIONAL FOREST						
Idaho						
Clearwater	299	184	0	0	0	0
Idaho Panhandle	1,166	830	0	0	0	0
Nez Perce	386	372	0	7	0	0
Salmon-Challis	670	420	0	0	0	0
Targhee	138	557	2.2	5	0	0
Montana						
Beaverhead-Deerlodge	1,050	741	10	5	0	0
Bitterroot	120	130	0	0	0	0
Custer	95	50	0	6.6	0	0
Flathead	500	795	0	0	0	1
Gallatin	981	202	0.5	8	0	0
Helena	447	168	0	5	0	0
Kootenai	400	450	0	0	1	0
Lewis and Clark	327	323	0	0	0	0
Lolo	704	621	0	7.1	0	0
Utah						
Ashley	211	353	0	1.7	0	0
Wyoming						
Bighorn	125	51	0	0	0	0
Bridger-Teton	848	624	0	0	1	1
Shoshone	197	58	2	0	0	0
TOTAL	8,664	6,929	14.7	45.4	2	2

Table K-13. Forest roads in lynx habitat, part 2

	New open last 5 years	New open planned next 5 years	Upgrades planned next 5 years	On ridge-top planned next 10 years
NATIONAL FOREST				
Idaho				
Clearwater	0.4	0	7.2	2.8
Idaho Panhandle	0.7	0	0	0
Nez Perce	0	0	0	0
Salmon-Challis	0	0	12	0
Targhee	0.8	2.5	5	0.2
Montana				
Beaverhead-Deerlodge	0.3	2.4	1.5	0
Bitterroot	0	0	0	0
Custer	0	0	14	0
Flathead	2	0	0	0
Gallatin	0	0	5	2
Helena	0	0	20	0
Kootenai	0	0	4	0
Lewis and Clark	0	0	0	0
Lolo	0	0	63.4	0
Utah				
Ashley	0	0	1.7	0
Wyoming				
Bighorn	0.2	0	0	0
Bridger-Teton	10	0	100	2
Shoshone	0	0	3.6	0
TOTAL	14.4	4.9	237.4	7

Table K-14. Economic effects of precommercial thinning restrictions after a decade, assuming full funding

	Alt. A		Alt. B		Alt. C & E		Alt. D		Alt. F	
	Employ-ment -# of jobs	Labor Income ($M)	Employ-ment-# of jobs	Labor Income ($M)	Employ-ment-# of jobs	Labor Income ($M)	Employ-ment -# of jobs	Labor Income ($M)	Employ-ment-# o jobs	Labor Income ($M)
NATIONAL FOREST										
Idaho										
Clearwater	155	2,158	91	1,276	91	1,276	99	1,385	114	1,585
Idaho Panhandle	1,195	16,415	309	4,244	309	4,250	836	11,483	749	10,293
Nez Perce	235	3,281	136	1,901	136	1,901	138	1,928	136	1,901
Salmon-Challis	320	3,566	91	994	91	1,020	152	1,698	106	1,183
Targhee	467	5,196	89	990	89	990	94	1,047	94	1,047
Montana										
Beaverhead-Deerlodge	309	2,996	58	566	59	571	39	2,996	61	596
Bitterroot	164	1,359	159	1,321	160	1,325	160	1,333	160	1,325
Custer	117	1,405	107	1,286	107	1,286	117	1,404	117	1,404
Flathead	421	3,605	23	195	25	210	220	1,881	31	261
Gallatin	185	2,196	31	369	31	370	37	441	37	443
Helena	34	321	0	0	0	0	0	0	6	61
Kootenai	1,004	8,730	411	3,574	413	3,591	725	6,304	521	4,525
Lewis and Clark	56	688	5	61	5	61	5	61	5	63
Lolo	402	3,436	100	851	110	938	165	1,408	119	1,016
Utah										
Ashley	27	349	3	45	3	45	6	76	5	61
Wyoming										
Bighorn	96	1,113	70	813	70	813	73	846	71	822
Bridger-Teton	96	1,071	0	0	0	0	96	1,071	10	113
Shoshone	27	274	3	34	3	34	15	154	3	34

Table K-15. Comparative employment and labor income effects after a decade of precommercial thinning restrictions, assuming full funding

	Employment effects (# of jobs)				Labor income effects (thousands of $)			
	Alt B vs Alt A	Alt C & E vs Alt A	Alt D vs Alt A	Alt F vs Alt A	Alt B vs Alt A	Alts C & E vs Alt A	Alt D vs Alt A	Alt F vs Alt A
NATIONAL FOREST								
Idaho								
Clearwater	-64	-64	-56	-41	-882	-882	-773	-573
Idaho Panhandle	-886	-886	-359	-446	-12,171	-12,165	-4,932	-6,122
Nez Perce	-99	-99	-97	-99	-1,380	-1,380	-1,353	-1,380
Salmon-Challis	-229	-229	-168	-214	-2,546	-2,546	-1,868	-2,383
Targhee	-378	-378	-373	-373	-4,206	-4,206	-4,149	-4,149
Montana								
Beaverhead-Deerlodge	-251	-250	0	-248	-2,430	-2,425	0	-2,400
Bitterroot	-5	-4	-4	-4	-38	-34	-27	-34
Custer	-10	-10	0	0	-120	-120	-1	-1
Flathead	-398	-396	-201	-390	-3,411	-3395	-1,724	-3,344
Gallatin	-154	-154	-148	-148	-1,827	-1,825	-1,755	-1,753
Helena	-34	-34	-34	-28	-321	-321	-321	-260
Kootenai	-593	-591	-279	-483	-5,157	-5,140	-2,427	-4,205
Lewis and Clark	-51	-51	-51	-51	-627	-627	-627	-625
Lolo	-302	-292	-237	-283	-2,585	-2,499	-2,029	-2,420
Utah								
Ashley	-24	-24	-21	-22	-304	-304	-272	-288
Wyoming								
Bighorn	-26	-26	-23	-25	-301	-301	-267	-291
Bridger-Teton	-96	-96	0	-86	-1,071	-1,071	0	-958
Shoshone	-24	-24	-12	-24	-240	-240	-120	-240

Table K-16. Economic effects of precommercial thinning restrictions after a decade, assuming historic average funding

	Alt. A		Alt. B		Alt. C &E		Alt. D		Alt. F	
	Employ-ment (# of jobs	Labor Income ($M)	Employ-ment (# of jobs)	Labor Income ($M)	Employ-ment (# of jobs	Labor Income ($M)	Employ-ment (# of jobs)	Labor Income ($M)	Employ-ment (# of jobs	Labor Income ($M)
NATIONAL FOREST										
Idaho										
Clearwater	50	691	29	408	29	408	32	443	36	507
Idaho Panhandle	382	5,252	99	1,358	99	1,360	267	3,675	240	3,294
Nez Perce	75	1,050	44	608	44	608	44	617	44	608
Salmon-Challis	118	1,319	34	377	34	377	56	628	39	438
Targhee	173	1,922	33	366	33	366	35	387	35	387
Montana										
Beaverhead-Deerlodge	99	959	19	181	19	183	99	959	20	19
Bitterroot	52	435	51	423	51	424	51	426	51	424
Custer	37	450	34	411	34	411	37	449	37	449
Flathead	135	1,154	7	62	8	67	70	602	10	84
Gallatin	59	703	10	118	10	119	12	141	12	142
Helena	11	103	0	0	0	1	0	25	2	20
Kootenai	321	2,794	132	1,144	132	1,149	232	2,017	167	1,448
Lewis and Clark	18	220	2	19	2	20	2	20	2	20
Lolo	129	1,100	32	272	35	300	53	451	38	325
Utah										
Ashley	10	129	1	17	1	17	2	28	2	22
Wyoming										
Bighorn	58	668	42	488	42	488	44	508	43	493
Bridger-Teton	36	396	0	0	0	0	36	396	4	42
Shoshone	16	165	2	20	2	20	9	93	2	20

Table K-17. Comparative employment and labor income effects after a decade of precommercial thinning restrictions, assuming historic average funding

	Employment effects (# of jobs)				Labor income effects (thousands of $)			
	Alt B vs Alt A	Alt C & E vs Alt A	Alt D vs Alt A	Alt F vs Alt A	Alt B vs Alt A	Alt C & E vs Alt A	Alt D vs Alt A	Alt F vs Alt A
NATIONAL FOREST								
Idaho								
Clearwater	-21	-21	-18	-14	-282	-282	-247	-184
Idaho Panhandle	-283	-283	-115	-142	-3,895	-3,893	-1,578	-1,958
Nez Perce	-31	-31	-31	-31	-442	-442	-433	-442
Salmon-Challis	-84	-84	-62	-79	-942	-942	-691	-881
Targhee	-140	-140	-138	-138	-1,556	-1,556	-1,535	-1,535
Montana								
Beaverhead-Deerlodge	-80	-80	0	-79	-778	-776	0	-768
Bitterroot	-1	-1	-1	-1	-12	-11	-9	-11
Custer	-3	-3	0	0	-38	-38	0	-1
Flathead	-128	-127	-65	-125	-1,091	-1,086	-552	-1,070
Gallatin	-49	-49	-47	-47	-585	-584	-562	-561
Helena	-11	-11	-11	-9	-103	-102	-78	-83
Kootenai	-189	-189	-89	-154	-1,650	-1,645	-777	-1,346
Lewis and Clark	-16	-16	-16	-16	-201	-200	-200	-200
Lolo	-98	-94	-76	-91	-827	-800	-649	-775
Utah								
Ashley	-9	-9	-8	-8	-112	-112	-101	-107
Wyoming								
Bighorn	-16	-16	-14	-15	-180	-180	-160	-175
Bridger-Teton	-36	-36	0	-32	-396	-396	0	-354
Shoshone	-14	-14	-7	-14	-144	-144	-72	-145

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Appendix L – Cumulative effects

The following past, present, and reasonably foreseeable programmatic actions have or will affect units in the planning area. These actions were used to evaluate the cumulative programmatic effects. Several other actions were considered but were not included in the cumulative effects analysis because they either did not affect lynx habitat, or were not of the nature to have cumulative effects (see Project Record, Summary of actions reviewed for cumulative effects, where no cumulative effect was noted).

Existing land & resource management plans & land use plans, as amended

Existing plans form the baseline of effects. The effects of these plans have previously been determined and disclosed in appropriate NEPA documents.

Past programmatic amendments & federal policies that affect units in the planning area

Past programmatic actions either amended existing plans, or added or changed higher-level policy that affected existing plans. Policy decisions have been incorporated into the Code of Federal Regulations (CFRs). Both amendments and policy decisions are listed because they changed management direction similar to the lynx proposal, or because they affected many existing plans in the planning area.

Past amendments

PACFISH & INFISH

PACFISH (the 1994 Interim Strategies for Managing Anadromous Fish-producing Watersheds in Eastern Oregon and Washington, Idaho and Portions of California) and INFISH (the 1996 Inland Native Fish Strategies) amended plans, establishing management requirements within riparian habitat conservation areas that apply to all FS and BLM units with lynx habitat west of the Continental Divide. PACFISH and INFISH generally require retaining vegetation near streams and wetlands.

PACFISH and INFISH

- Improve habitat for wildlife, plant and aquatic species, including lynx by minimizing activities in riparian areas
- May reduce amount of area available for timber harvest
- May increase insect and disease in some areas
- May increase fuel buildup in some areas
- May reduce number of AUMs in grazing allotments or affect the timing of operations
- May increase costs for transportation systems,

recreation sites, and mineral and energy development

Forest Plan amendments for access management in the Selkirk and Cabinet/Yaak Grizzly Bear Recovery Zones

In March 2004, the Kootenai, Idaho Panhandle, and Lolo NFs amended their plans to change existing plan objectives, standards and guidelines about motorized access in the Selkirk and Cabinet-Yaak Grizzly Bear Recovery Zones (USDA Forest Service, 2004a). The preferred alternative, Alternative E, sets road densities and core areas for each BMU (bear management unit) reflecting the unique features of each BMU. The grizzly bear access management amendment:

- Could improve habitat for wildlife, plant and aquatic species
- May increase fire risk lands where access is restricted
- Could reduce timber harvest
- Could reduce areas available for precommercial thinning
- May change recreational user experiences, especially where vegetation grows back in restricted roads
- Would not affect mineral and energy development, grazing or land acquisition

On December 13, 2006 Judge Donald Malloy, United States District Court for the District of Montana, set aside this EIS and ROD and remanded the matter back to the FS for preparation of a new environmental analysis. The timeframe for a new decision and what that decision might entail is not known at this time.

Forest Plan amendments for Grizzly Bear Habitat Conservation for the Greater Yellowstone Area National Forests

A Record of Decision was issued in April 2006 which amended six forest plans on six Great Yellowstone Area national forests (Beaverhead-Deerlodge, Bridge-Teton, Caribou-Targhee, Custer, Gallatin, and Shoshone). The amendment incorporates habitat standards and other relevant provisions in the Final Conservation Strategy for the Grizzly Bear in the Greater Yellowstone Area (USDA Forest Service, 2006a).

The purpose and need is to ensure conservation of habitat to sustain the recovered grizzly bear population, update the management and monitoring of grizzly bear habitat, provide consistency among Greater Yellowstone Area national forests in managing grizzly bear habitat, and ensure the adequacy of regulatory mechanisms for grizzly bear habitat protection upon delisting as identified in the Grizzly Bear Recovery Plan.

The grizzly bear conservation strategy (USDA Forest Service, 2006b, 2006c)

- Could maintain habitat for wildlife, including lynx, plant, and aquatic species
- Would have a minor effect on mineral and energy development, or land acquisition

due to increased time delays and costs
- Would have no net change on cattle grazing
- Keeps developed recreation at existing levels
- May limit size and number of individual fuel reduction projects requiring new motorized access inside the primary conservation area.

Forest Plan amendment for winter motorized recreation on the Flathead National Forest.

In November 2006, the Flathead NF issued a Record of Decision for the Winter Motorized Recreation Plan (USDA, Forest Service, 2006d). The decision establishes a plan for managing over-snow vehicle recreation, including identifying where and when over-the-snow motorized vehicle recreation will be allowed; what criteria will be considered; and what monitoring will be conducted.

The winter motorized recreation amendment would
- Maintain and improve habitat for wildlife, including lynx habitat
- Would not affect mineral and energy development, grazing, or land acquisition
- Could change user experiences and winter recreation opportunities on the Flathead National Forest.

At this time this Decision is under administrative appeal. The decision on the appeal is not known at this time this document went to the printer.

OHV (off highway vehicle) amendment for Montana

In January 2001, this amendment applying to NF lands in Montana established a new standard restricting yearlong, wheeled motorized cross-country travel where it was not already restricted, with certain exceptions (USDA, FS, Northern Region 2001).

The OHV amendment
- Improves habitat for wildlife, plant and aquatic species
- Has no effect on fire management, forest management, grazing, transportation systems, mineral and energy development, winter recreation, or land acquisition

Past policy decisions

BLM Healthy Rangeland Initiative

This 1998 policy incorporated at 43 CFR 4180 the Healthy Rangeland standards and guidelines that describe how livestock grazing is managed on all BLM lands. The policy requires certain habitat conditions be provided for terrestrial and aquatic species.

The Healthy Rangeland Initiative
- Improves habitat for wildlife, including lynx, plant and aquatic species
- May reduce number of AUMs in grazing allotments or affect the timing of operations

- Has no effect on fire management, forest management, transportation systems, mineral and energy development, winter recreation or land acquisition

The Roads Policy

This 2001 policy incorporated at 36 CFR 212 provides the FS direction about its transportation system. Adopted after the LCAS was finalized, the Roads Policy gives managers a scientific analysis process to inform their decision-making. It directs the agency to maintain a safe, environmentally sound road network that's responsive to public needs and affordable to manage, where unneeded roads are decommissioned.

The Roads Policy generally has no effects since it is an analysis process. It is likely to improve habitat for wildlife, plant, and aquatic species.

The National Travel Management Final Rule

In November 2005, the Forest Service published a new travel management rule governing motor vehicle use on national forests and grasslands (USDA FS, 2005). Under the final rule, each national forest or ranger district will designate those roads, trails, and areas open to motor vehicle use by class of vehicle and, if appropriate, by time of year. As designation is complete on a national forest or ranger district, motor vehicle use off of the designated system will be prohibited. Designated routes and areas will be identified on a motor vehicle use map. Motor vehicle use outside of designated routes and areas will be provided for fire, military, emergency, and law enforcement purposes, and for use under Forest Service permit. Valid existing rights are honored. The rule also maintains the status quo for snowmobile use, as determined in individual forest plans.

The transportation rule will:

- Improve habitat for wildlife, plant and aquatic species because once local decisions are made motor vehicle use off designated routes will be prohibited
- Likely have no effect on fire management, forest management, grazing, transportation systems, mineral and energy development, winter recreation, or land acquisition because it does not affect permits or valid existing rights.

Several units have started and/or completed the travel planning process for all or a portion of their forests. The units include the Bridger Teton, Custer, Gallatin, Helena, and Lewis and Clark National Forests.

Roadless Area Conservation Strategy, "The Roadless Policy"

In January 2001, the Roadless Policy was incorporated at 36 CFR 294, prohibiting road construction and reconstruction, and timber removal in inventoried roadless areas on NF

lands, with certain exceptions (USDA FS, 2001).

In May of 2001, a preliminary injunction was issued by the District Court of Idaho against implementing the Roadless Policy. This injunction was vacated by the 9th Circuit Court of Appeals. However, in July 2003, the District Court of Wyoming again enjoined implementation of the Roadless Policy.

On May 13, 2005 the Department of Agriculture issued a new roadless rule – which some call the "State Petitions Rule" (USDA FS 2005). This new rule: (1) established a State petitioning process for management direction of Inventoried Roadless Areas (IRAs); (2) established the Roadless Area Conservation National Advisory Committee; (3) required individual states to recommend management priorities for individual IRAs in their petitions; and (4) did not change any on-the-ground management direction contained in individual forest plans. In addition, until forest plans are revised the agency issued interim management direction to conserve the roadless character with some exceptions (Interim direction 1920-2006-1).

In September 2006, the United State District Court for the Northern District of California set aside the State Petitions Rule and directed the agency to apply the direction from the 2001 Roadless Rule.

The Roadless Policy, if fully implemented:

- Improves habitat for wildlife, plant and aquatic species, so cumulatively contributes to the conservation of lynx
- May increase fire risk in unroaded lands because of reduced timber removal
- May change user recreational experiences
- May limit development of some ski areas
- May change which areas are available for mineral and energy development
- Would have only a limited affect on grazing, mostly by reducing the forage created by timber harvest
- Would have no effect on land acquisition

For this analysis, it is assumed that road construction in roadless areas would be limited; therefore many of the effects described in the Roadless Area Conservation EIS would occur.

National Fire Plan and Healthy Forests Initiative

The 2000 National Fire Plan seeks to manage the impact of wildfires on communities and the environment by setting goals for wildland fire policy for the FS and BLM.

In September 2000, a report to the President – *Managing the Impact of Wildfires on Communities and the Environment* was issued (USDI and USDA FS, 2000). This report provides recommendations to the Departments of Agriculture and Interior on how best to respond to the severe fire season of 2000. Key

recommendations include: (1) provide additional fire fighting resources; (2) restore fire damaged landscapes and communities; (3) increase efforts to remove hazardous fuels, and (4) work directly with local communities to improve community fire-fighting capacity and coordination, implement restoration and fuel reduction projects, and expand education and risk mitigation efforts in the Wildland Urban Interface (WUI). This report provided the basis and conceptual framework for the National Fire Plan, and the 10-Year Compressive Strategy.

10-Year Comprehensive Strategy
The 2001 10-Year Comprehensive Strategy takes a collaborative approach to reducing wildland fire risks to communities and the environment for the FS, also setting goals for wildland fire policy (USDA FS, 2001).

Both the National Fire Plan and the 10-Year Comprehensive Strategy share goals to:

- Improve fire prevention and suppression
- Promote community assistance
- Restore fire-adapted ecosystems (post-fire restoration)
- Reduce hazardous fuels

The Development of a Collaborative Fuel Treatment Program
The 2003 multiparty memorandum of understanding (MOU) describes criteria for selecting FS fuel treatment projects, defining high-priority areas as the wildland urban interface (WUI) and forest Condition Classes 2 and 3 outside the WUI (USDA FS, USDI BLM, FWS, NPS, 2003)

These documents do not prescribe specific outcomes; they are not programmatic decisions. They merely identify actions that should be taken to respond to the National Fire Plan.

Healthy Forests Initiative
In August 2002, the President issued the *Healthy Forests: An Initiative for Wildfire Prevention and Stronger Communities*. The intent of the initiative is to better protect people and natural resources by lowering the procedural and process hurdles that impede the reduction of hazardous fuels on public land. The initiative includes:

- Improving procedures for developing and implementing fuels treatment and forest restoration projects in priority forests and rangelands;
- Reducing the number of overlapping environmental reviews by combining project analysis and establishing a process for concurrent project clearance by federal agencies;
- Developing guidance for weighing the short-term risk against the long-term benefits of fuel treatment and restoration projects;
- Developing guidance to ensure consistent NEPA procedures for fuel treatment activities and restoration activities.

One outcome of the Healthy Forests Initiative was the Healthy Forests Restoration Act of 2003 (HFRA).

Healthy Forests Restoration Act of 2003 (P.L. 108-148).

The Act, approved by Congress in December 2003, applies to the FS and BLM. The Act contains a variety of provisions to expedite hazardous-fuel reduction and forest-restoration projects on specific types of Federal land that are at risk of a wildland fire or insect and disease epidemics. The act helps rural communities, States, Tribes, and landowners restore healthy forest and rangeland conditions, on State, Tribal, and private lands.

Even though they do not specify outcomes, the direction set forth in these documents (the National Fire Plan and HFRA) was considered in the effects analysis. Estimates, based on FIA data for Montana, were made to approximate the amount of lynx habitat that could be affected by fuel treatments and how the alternatives may affect implementing the National Fire Plan and HFRA.

The Healthy Forests Initiative and HFRA would have no affect as they do not authorize projects, but instead provide a process for project level analysis. Projects implemented under the initiative and act are:

- Likely to improve habitat for some wildlife, plant and aquatic species and reduce habitat for others
- Likely will not effect grazing, transportation systems, winter recreation, land acquisition, or mineral & energy development
- Likely to reduce winter snowshoe hare habitat if treated areas are not allowed to re-grow densely
- Consistent with existing plans.

Energy Implementation Plan

The 2001 FS Energy Implementation Plan was written to implement elements of Executive Order 13212, *Actions to Expedite Energy Related Projects,* also called the National Energy Plan (USDA FS, 2001a). The National Energy Plan encourages agencies to "...expedite their review of permits and or take other actions necessary to accelerate the completion of such projects, while maintaining safety, public health, and environmental protections..."

Priority areas were identified in areas with a high potential for energy development. The Custer, Ashley, and Bridger-Teton NFs were identified as high priority in the planning area because they have oil and gas, even though the potential for oil and gas occurrence and development is rated low or very low. Further, most oil and gas leases take place outside lynx habitat.

The Energy Implementation Plan does not prescribe any specific outcome and is not a programmatic decision. It merely identifies actions that should be taken to respond to the National Energy Plan.

Even though it does not specify outcomes, the direction set forth was considered in the effects analysis.

The National Energy Plan would have limited cumulative effects on resources in lynx habitat because most of the federal oil and gas leases occur outside lynx habitat.

Actions on lands not part of the Northern Rockies Lynx analysis area, but in the Northern Rockies Geographic area.

Past Actions

Yellowstone and Grand Teton National Park snowmobile regulations

In November 2004, the Park Service published a final rule in the *Federal Register* (FR Vol. 69, No. 271, pp. 65348-65366, November 10, 2004; USDI, National Park Service 2004) regarding snowmobile use in Yellowstone and Grand Teton National Parks. The final rule provides interim direction until the after the 2006-2007 season. The interim rule (1) limits the number of snowmobiles allowed per day; (2) requires all snowmobile users in Yellowstone National Park be accompanied by a commercial guide; and (3) requires the use of the Best Available Technology in order to reduce emissions.

The snowmobiling regulations

- Would maintain habitat for wildlife, plant, and aquatic species
- Have no effect on fire management, forest management, transportation systems, mineral and energy development, grazing, or land acquisitions
- Could change winter recreation user experiences

The interim regulations will expire after the 2006-2007 winter season; therefore in June 2005 the NPS issued a Notice of Intent to prepare an Environmental Impact Statement (FR Vol. 70, No. 121, pp. 36656). The EIS will analyze similar aspects of the winter motorized travel in the park and is likely to have similar effects as noted above.

Other actions which incorporate or will incorporate lynx management direction.

Private lands

Several private timber companies have developed lynx management plans, including the Boise-Cascade Corporation in central Idaho and eastern Washington, Plum Creek Timber Company, Ltd. in Idaho and Montana, and Stimson Timber Company in northern Idaho and eastern Washington.

Generally, these plans were developed to respond to the legal requirement that on private lands, a landowner is required to not act in ways that would result in the "taking" of lynx as defined under the Endangered Species Act. Private lands are not required to manage habitat to conserve lynx.

Private-land with lynx management plans

- Could improve habitat conditions for lynx and other wildlife
- Would have no effect on fire management, forest management, transportation systems, mineral and energy development, grazing, or land acquisition

Private lands without lynx management plans

- Could reduce the quality and quantity of lynx habitat and habitat for other species.
- Would have no effect on fire management, forest management, transportation systems, mineral and energy development, grazing, or land acquisition

Forest Plan revision, amendments on NF and BLM lands not part of this proposal

NF lands inside the geographic area but not part of this proposal have either revised, are in the process of revising, or will soon begin revising their plans to incorporate measures to conserve lynx. BLM units will either amend or their revise plans. In the meantime, recommendations from the LCAS are being considered during project planning and implementation.

The following summarizes these planning efforts

- In Region 4, the Payette, Boise, Sawtooth, Caribou, Wasatch-Cache and Unita NFs have completed revision, using information from this proposal.
- In Region 6, the Colville, Umatilla, Wallowa-Whitman, Malheur NFs will address lynx during revision which began by 2004. The Ochoco will address lynx when they begin revision in the future.
- In Montana, in 2004, the BLM incorporated management direction for the conservation of lynx into the Garnet Resource Area.
- In Wyoming, in 2005, the BLM completed a Final Statewide Programmatic Canada Lynx Biological Assessment which adopts Best Management Practices to contribute to the recovery of the species (USDI BLM Wyoming, 2005; USDI FWS, 2005).
- In Washington, the BLM Spokane District Resource Management Plan was modified in 2003 to incorporate all of the provisions of the LCAS.
- In Idaho, the BLM is incorporating management direction into their resource management plans; which will likely be completed in 2007.
- In Utah, BLM only contains linkage areas, and linkage direction will be incorporated into their plans at a later date.

All of these changes to plans protect essential habitat features and provide appropriate management to provide for the conservation of lynx and contribute to the recovery of lynx.

Proposed Issuance of an Incidental Take Permit to the Montana Department of Natural Resources and Conservation on Forested State Trust Lands in Montana

The FWS is preparing an EIS to address the proposed issuance of an incidental take permit to allow take of species on State Trust lands administered by the Montana Department of Natural Resources and Conservation (DNRC) for activities primarily related to forest management. The DNRC is preparing a HCP (Habitat Conservation Plan) as part of the application for the permit. (*Federal Register*, Vol. 68. No. 81, pp. 22412-22414, April 28, 2003, and Montana DNRC, 2005).

For the proposed HCP, the DNRC would develop specific conservation measures for the following categories: biodiversity and silviculture, road management, watershed/riparian areas, grazing on classified forest lands, weed management, land use planning, administration and implementation.

The development of an HCP and issuance of a taking permit

- Could improve habitat for wildlife, plant, and aquatic species
- Could reduce timber harvest on state lands
- Could reduce areas available for precommercial thinning on state lands
- May change recreational user experiences
- Would not affect mineral and energy development, or land acquisition
- May change grazing practices on state lands

Flathead Indian Reservation

The Flathead Indian Reservation is the only reservation with lynx habitat in the analysis area. The tribal lands are managed under their Forest Management Plan which incorporates the provisions of the LCAS (Confederated Salish and Kootenai Tribes, 2000, p 285).

The incorporation of lynx management direction:

- Could improve habitat for wildlife, plant, and aquatic species
- Could reduce timber harvest on tribal lands in some situations
- Could reduce areas available for precommercial thinning on tribal lands
- May change recreational user experiences
- Would not affect mineral and energy development, or land acquisition
- Would not affect grazing

Critical habitat listing

On November 9, 2006 the FWS designated critical habitat for the contiguous United States distinct population segment of the Canada lynx (USDI, FWS 2006). In the Northern Rockies, the areas of Glacier National Park above 4,000 feet on the west side of the Continental Divide and to the Park borders east of the Continental Divide constitute the critical habitat. No National Forests in the Northern

Rockies were designated critical habitat for Canada lynx.

Critical habitat designation: 1) provides additional protection to habitat only where there is a federal action; 2) adds protection only where, in the absence of designation, destruction or adverse modification would, in fact, take place; and 3) triggers the prohibition of destruction or adverse modification of the habitat. However, designation of critical habitat does not require specific actions to restore or improve habitat (USDI, FWS 2006).

Appendix M Fuel treatment data

Part I: Fuel treatment program

Table M- 1. Fuel treatment program over next decade

	10 yr fuel treatment program *total acres*	10 yr fuel treatment program In lynx Habitat *acres*	10 yr fuel treatment program outside lynx habitat *acres*	*Percent of* fuel treatment program in lynx habitat
NATIONAL FORESTS				
Idaho				
Clearwater	144,000	63,750	80,250	44%
Idaho Panhandle	122,000	43,300	78,700	35%
Nez Perce	116,000	32,560	83,440	28%
Salmon-Challis	110,000	49,500	60,500	45%
Targhee	105,000	60,120	44,880	57%
Idaho Summary	*597,000*	*249,230*	*347,770*	
Montana				
Beaverhead-Deerlodge	72,000	49,920	22,080	69%
Bitterroot	93,000	21,080	71,920	23%
Custer	112,000	21,780	90,220	19%
Flathead	108,000	66,640	41,360	62%
Gallatin	50,000	19,050	30,950	38%
Helena	77,000	31,150	45,850	40%
Kootenai	167,000	42,960	124,040	26%
Lewis and Clark	67,000	34,840	32,160	52%
Lolo	191,000	49,230	141,770	26%
Montana Summary	*937,000*	*336,650*	*600,350*	
Utah				
Ashley	263,000	132,850	130,150	51%
Wyoming				
Bighorn	89,000	32,400	56,600	36%
Bridger-Teton	160,000	94,240	65,760	59%
Shoshone	127,000	36,070	90,930	28%
Wyoming Summary	*376,000*	*162,710*	*213,290*	
TOTAL	2,173,000	881,440	1,291,560	41%

Table M-2 . Fuel treatment program over next decade in WUI

	Total acres in WUI[1]	Acres of lynx habitat in WUI[2]	*Total* 10-year fuel treatment in WUI[3]	10-year fuels treatment program *in* lynx habitat In WUI[4]	10-year fuels treatment program *outside* lynx habitat In WUI	% of fuel treatment program in lynx habitat in WUI
NATIONAL FORESTS						
Idaho						
Clearwater	50,900	90	19,000	0	19,000	0%
Idaho Panhandle	667,600	72,300	39,000	4,290	34,710	11%
Nez Perce	119,800	15,800	40,000	5,200	34,800	13%
Salmon-Challis	163,800	83,200	44,000	22,440	21,560	51%
Targhee	100,000	55,400	26,000	14,300	11,700	55%
Idaho Summary	*1,102,100*	*226,790*	*168,000*	*46,230*	*121,770*	
Montana						
Beaverhead-Deerlodge	211,700	154,400	50,000	36,500	13,500	73%
Bitterroot	202,300	17,600	52,000	4,680	47,320	9%
Custer	79,200	22,800	5,000	1,450	3,550	29%
Flathead	247,000	131,800	61,000	32,330	28,670	53%
Gallatin	252,400	94,400	45,000	16,650	28,350	37%
Helena	180,300	69,300	50,000	19,000	31,000	38%
Kootenai	651,600	52,000	87,000	6,960	80,040	8%
Lewis and Clark	69,100	35,800	33,000	17,160	15,840	52%
Lolo	556,800	71,200	130,000	16,900	113,100	13%
Montana Summary	*2,450,400*	*649,300*	*513,000*	*151,630*	*361,370*	
Utah						
Ashley	56,000	27,200	64,000	31,360	32,640	49%
Wyoming						
Bighorn	43,400	7,800	22,000	13,640	8,360	62%
Bridger-Teton	70,700	43,900	36,000	22,320	13,680	62%
Shoshone	24,300	7,600	61,000	18,910	42,090	31%
Wyoming Summary	*138,400*	*59,300*	*119,000*	*54,870*	*64,130*	
TOTAL	3,746,900	962,590	864,000	284,090	579,910	33%

[1] Based on approximation of WUI – 1 mile from communities listed in the August 17, 2001 Federal Register or from the boundary of a community measured as 28 people per square mile

[2] Based on same map as used in footnote number 1 but overlapped with lynx habitat

[3] Based on 5 year program of work for the NFS lands (see project file – Analysis section, FEIS, Fire data)

[4] The 10 year program in the WUI multiplied by the % of WUI that is lynx habitat

Table M-3. Fuel treatment program over next decade outside WUI

	Total acres outside WUI[5]	Acres of lynx habitat outside WUI[6]	*Total* 10-year fuel treatment outside WUI[7]	10-year fuels treatment program *in* lynx habitat outside WUI[8]	10-year fuels treatment program *outside* lynx habitat outside WUI	% of fuel treatment program in lynx habitat outside WUI
NATIONAL FOREST						
Idaho						
Clearwater	1,774,500	929,910	125,000	63,750	61,250	51%
Idaho Panhandle	1,830,600	1,097,700	83,000	39,010	43,990	47%
Nez Perce	2,104,400	794,200	76,000	27,360	48,640	36%
Salmon-Challis	4,187,100	1,716,800	66,000	27,060	38,940	41%
Targhee	1,710,900	994,600	79,000	45,820	33,180	58%
Idaho Summary	*11,607,500*	*5,533,210*	*429,000*	*203,000*	*226,000*	
Montana						
Beaverhead-Deerlodge	3,149,200	1,905,600	22,000	13,420	8,580	61%
Bitterroot	1,378,600	622,400	41,000	16,400	24,600	4%
Custer	1,108,400	207,200	107,000	20,330	86,670	19%
Flathead	2,108,600	1,598,200	47,000	34,310	12,690	73%
Gallatin	1,554,200	775,600	5,000	2,400	2,600	48%
Helena	795,100	370,700	27,000	12,150	14,850	45%
Kootenai	1,590,900	958,000	80,000	36,000	44,000	45%
Lewis and Clark	1,793,200	934,200	34,000	17,680	16,320	52%
Lolo	1,526,000	1,038,800	61,000	32,330	28,670	53%
Montana Summary	*15,004,200*	*8,410,700*	*424,000*	*185,020*	*238,980*	
Utah						
Ashley	1,328,100	672,800	199,000	101,490	97,510	52%
Wyoming						
Bighorn	1,064,300	302,200	67,000	18,760	48,240	28%
Bridger-Teton	3,366,800	1,956,100	124,000	71,920	52,080	58%
Shoshone	2,412,600	632,400	66,000	17,160	48,840	26%
Wyoming Summary	*6,843,700*	*2,890,700*	*257,000*	*107,840*	*149,160*	
TOTAL	34,783,500	17,507,410	1,309,000	597,350	711,650	46%

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5 Based on total unit acres (Appendix C) minus acres in WUI (Table M-xx)

6 Based on lynx habitat acres (Appendix C) minus acres in WUI in lynx habitat (Table M- XX)

7 Based on 5 year program of work for the NFS lands (see project file – Analysis section, FEIS, Fire data)

8 The 10 year program outside the WUI multiplied by the % the unit that is lynx habitat (Appendix C)

Appendix M – Part 2 – Amount of fuel treatment in winter snowshoe hare habitat

Assumptions used in this analysis include:

- Analysis is for Montana only
- Treatments would occur equally everywhere
- WUI (wildland urban interface) is defined as within one mile of human habitation, which is defined as 28 people per square mile, based on the year 2000 census - or whose community or infrastructure is on the August, 17, 2001, Federal Register list of Urban Wildland Interface Communities within the vicinity of Federal Lands that are a High Risk from Wildfire (Federal Register, Vol. 66, No. 160).
- In Montana about 93,700 acres of fuel treatments are planned per year (based on 5-yr program of work –see Project Record/Analysis/Fire/FEIS/data)
- 51,300 acres of fuel treatment would occur inside the WUI per year
- 42,400 acres of fuel treatment would occur outside the WUI per year
- *High density* winter snowshoe hare habitat is 5,000+ trees per acre in young forests and 2,500+ trees per acre in multistoried forests
- *Low density* winter snowshoe hare habitat is 2,500 to 5,000 trees per acre in young forests and 1,000 to 2,500+ trees per acre in multistoried forests

There are about 17,454,500 total acres in National Forest system lands Montana

- 2,450,400 acres are within the WUI
- 15,004,100 acre outside the WUI

Of the 2,450,400 acres in the WUI

- 649,300 acres are lynx habitat
- 1,801,100 are not lynx habitat

Of the 15,004,100 acres outside the WUI

- 8,410,700 acres are lynx habitat
- 6,593,400 acres are not lynx habitat

Table M-4. Acres of winter snowshoe hare habitat based on density, young vs. multistory forests, and within and outside the WUI and Wilderness

Winter snowshoe hare habitat Category	Acres within WUI	Acres outside WUI
High density young	61,000	676,000
High density multistory	41,000	1,079000
Total high density	**102,000**	**1,755,000**
Low density young	55,000	491,000
Low density multistory	61,000	751,000
Total low density	**116,000**	**1,242,000**

Table M-5. Calculations for fuel treatment in Montana

Winter snowshoe hare habitat	Winter snowshoe hare habitat acres		Montana acres Inside or outside WUI		%		Montana fuel treatment acres		Annual Montana fuel treatment acres		10 years per decade		Montana fuel treatment per decade acres
Inside WUI													
High density	102,000	÷	2,450,400	=	4%	x	51,300	=	2,050	x	10	=	20,500
Low density	116,000	÷	2,450,400	=	5%	x	51,300	=	2,565	x	10	=	25,650
Lynx habitat but not good forage	431,300	÷	2,450,400	=	18%	x	51,300	=	9,200	x	10	=	92,000
Not lynx habitat	1,801,100	÷	2,450,400	=	74%	x	51,300	=	38,000	x	10	=	380,000
Outside WUI													
High density	1,755,000	÷	15,004,100	=	12%	x	42,400	=	5,100	x	10	=	51,000
Low density	1,242,000	÷	15,004,100	=	8%	x	42,400	=	3,400	x	10	=	34,000
Lynx habitat but not good forage	5,413,700	÷	15,004,100	=	36%	x	42,400	=	15,300	x	10	=	153,000
Not lynx habitat	6,593,400	÷	15,004,100	=	44%	x	42,400	=	18,600	x	10	=	186,000

Table M-6. Summary of fuel treatment acres by winter snowshoe hare habitat category & WUI next decade

Winter snowshoe hare habitat category	Inside WUI		Outside WUI		Totals
High density	20,500	+	51,000	=	71,500 acres
Low density	25,700	+	34,000	=	59,700 acres
Lynx habitat but not good forage	92,000	+	153,000	=	245,000 acres
Not lynx habitat	380,000	+	186,000	=	566,000 acres

Assumptions for Tables M-7 through M-9

- Treated acres are proportional to their occurrence, regardless of any other factors
- Alternative A (no action) assumes no restrictions
- Alternative B (no precommercial thinning in young forests or multistory forests). *Assumption:* No fuel treatment in young winter snowshoe hare habitat since precommercial thinning is the primary tool. Assume 75 percent of the fuel treatment in multistoried would be done without precommercial thinning, e.g. would be commercial thin or regeneration harvest.
- Alternatives C and D (no fuel treatments in young or multistory winter snowshoe hare habitat)
  Assumption: No fuel treatment allowed
- Alternative E (no restriction on precommercial thinning if done for fuels treatment – if done in a collaborative manner; fuel treatment in multistory winter snowshoe hare habitat could go forward)
  Assumption: All fuel treatments would be allowed in winter snowshoe hare habitat.
- Alternative F (No restriction for fuel treatment projects within the WUI)
  Assumption: Only fuel treatments within WUI would be allowed. No fuel treatment would occur in winter snowshoe hare habitat outside the WUI.
  General assumption - all alternatives. Assumes fuel treatment projects would be shifted from winter snowshoe hare habitat and/or lynx habitat to other areas that would not be precluded from treatment under the alternative.

Table M7. Acres of fuel treatment in lynx habitat allowed in winter snowshoe hare habitat by alternative & WUI over the next decade in Montana

	Alt A	Alt B	Alt C	Alt D	Alt E	Alt F
Inside WUI						
High density young	12,300	0	0	0	12,300	12,300
High density multistoried	8,200	6,150	0	0	8,200	8,200
Low density young	12,100	0	0	0	12,100	12,100
Low density multistoried	13,600	10,200	0	0	13,600	13,600
Outside WUI						
High density young	19,900	0	0	0	19,900	0
High density multistoried	31,100	23,000	0	0	31,100	0
Low density young	13,600	0	0	0	13,600	0
Low density multistoried	20,400	15,300	0	0	20,400	0
Total fuel treatment	131,200	54,650	0	0	131,200	46,200

Table M-8. Summary of amount of fuel treatment (acres) allowed by category & alternative over next decade (rounded to nearest thousand)

Winter snowshoe hare habitat	Alt A	Alt B	Alt C	Alt D	Alt E	Alt F
Lynx habitat in forage condition	131,000	55,000	0	0	131,000	46,000
Lynx habitat but not good forage	245,000	245,000	245,000	245,000	245,000	245,000
Not lynx habitat[9]	561,000	637,000	692,000	692,000	561,000	646,000
Total fuels treatment	937,000	937,000	937,000	937,000	937,000	937,000

Table M-9. Montana fuel treatment acres relocated by winter snowshoe hare habitat category, alternative & WUI next decade

	Alt A	Alt B	Alt C	Alt D	Alt E	Alt F
Inside WUI						
High density young	0	12,300	12,300	12,300	0	0
High density multistoried	0	2,050	8,200	8,200	0	0
Low density young	0	12,100	12,100	12,100	0	0
Low density multistoried	0	3,400	13,600	13,600	0	0
Outside WUI						
High density young	0	19,900	19,900	19,900	0	19,900
High density multistoried	0	8,100	31,100	31,100	0	31,100
Low density young	0	13,600	13,600	13,600	0	13,600
Low density multistoried	0	5,100	20,400	20,400	0	20,400
Total relocated	0	76,550	131,200	131,200	0	85,000

[9] Assumes fuel treatment projects would be shifted from winter snowshoe hare habitat and/or lynx habitat to other areas that would not be precluded from treatment under the alternative.

Appendix N – Management direction for the Final EIS preferred alternative, Alternative F

GOAL[14]

Conserve the Canada lynx.

ALL MANAGEMENT PRACTICES AND ACTIVITIES (ALL). The following objectives, standards, and guidelines apply to all management projects in lynx habitat in lynx analysis units (LAUs) and in linkage areas, subject to valid existing rights. They do not apply to wildfire suppression, or to wildland fire use.

<u>Objective[30] ALL O1</u>

Maintain[26] or restore[40] lynx habitat[23] connectivity[16] in and between LAUs[21], and in linkage areas[22].

<u>Standard[44] ALL S1</u>

New or expanded permanent development[33] and vegetation management[49] projects[36] must maintain[26] habitat connectivity[16] in an LAU[21] and/or linkage area[22].

<u>Guideline[15] ALL G1</u>

Methods to avoid or reduce effects on lynx should be used when constructing or reconstructing highways[18] or forest highways[12] across federal land. Methods could include fencing, underpasses, or overpasses.

<u>Standard[44] LAU S1</u>

Changes in LAU[21] boundaries shall be based on site-specific habitat information and after review by the Forest Service Regional Office.

VEGETATION MANAGEMENT ACTIVITIES AND PRACTICES (VEG). The following objectives, standards, and guidelines apply to vegetation management projects[36] in lynx habitat within lynx analysis units (LAUs). With the exception of Objective VEG O3 that specifically concerns wildland fire use, the objectives, standards, and guidelines do not apply to wildfire suppression, wildland fire use, or removal of vegetation for permanent developments such as mineral operations, ski runs, roads, and the like. None of the objectives, standards, or guidelines apply to linkage areas.

<u>Objective[30] VEG O1</u>

Manage vegetation[49] to mimic or approximate natural succession and disturbance processes while maintaining habitat components necessary for the conservation of lynx.

Objective VEG O2

Provide a mosaic of habitat conditions through time that support dense horizontal cover[19], and high densities of snowshoe hare. Provide winter snowshoe hare habitat[51] in both the stand initiation structural stage and in mature, multi-story conifer vegetation.

Objective VEG O3

Conduct fire use[11] activities to restore[40] ecological processes and maintain or improve lynx habitat.

Objective VEG O4

Focus vegetation management[49] in areas that have potential to improve winter snowshoe hare habitat[51] but presently have poorly developed understories that lack dense horizontal cover.

Standard[44] VEG S1

Where and to what this applies: Standard VEG S1 applies to all vegetation management[49] projects[36] that regenerate[38] forests, except for fuel treatment[13] projects[36] within the wildland urban interface[50] (WUI) as defined by HFRA[17], subject to the following limitation:

Fuel treatment projects[36] within the WUI[50] that do not meet Standards VEG S1, VEG S2, VEG S5, and VEG S6 may occur on no more than 6 percent (cumulatively) of lynx habitat on each administrative unit (a unit is a National Forest).

For fuel treatment projects[36] within the WUI[50] see guideline VEG G10.

The standard: Unless a broad scale assessment has been completed that substantiates different historic levels of stand initiation structural stages[45] limit disturbance in each LAU as follows:

If more than 30 percent of the lynx habitat in an LAU is currently in a stand initiation structural stage that does not yet provide winter snowshoe hare habitat, no additional habitat may be regenerated by vegetation management projects[36].

Standard VEG S2

Where and to what this applies: Standard VEG S2 applies to all timber management[47] projects[36] that regenerate[38] forests, except for fuel treatment[13] projects[36] within the wildland urban interface[50] (WUI) as defined by HFRA[17], subject to the following limitation:

Fuel treatment projects[36] within the WUI[50] that do not meet Standards VEG S1, VEG S2, VEG S5, and VEG S6 may occur on no more than 6 percent (cumulatively) of lynx habitat on each administrative unit (a unit is a National Forest).

For fuel treatment projects[36] within the WUI[50] see guideline VEG G10.

The standard: Timber management[47] projects[36] shall not regenerate[38] more than 15 percent of lynx habitat on NFS lands within an LAU in a ten-year period.

Standard VEG S5

Where and to what this applies: Standard VEG S5 applies to all precommercial thinning[35] projects[36], except for fuel treatment[13] projects[36] that use precommercial thinning as a tool within the wildland urban interface[50] (WUI) as defined by HFRA[17], subject to the following limitation:

Fuel treatment projects[36] within the WUI[50] that do not meet Standards VEG S1, VEG S2, VEG S5, and VEG S6 may occur on no more than 6 percent (cumulatively) of lynx habitat on each administrative unit (a unit is a National Forest).

For fuel treatment projects[36] within the WUI[50] see guideline VEG G10.

The Standard: Precommercial thinning projects[36] that reduce snowshoe hare habitat may occur from the stand initiation structural stage[45] until the stands no longer provide winter snowshoe hare habitat only:

1. Within 200 feet of administrative sites, dwellings, or outbuildings; or
2. For research studies[39] or genetic tree tests evaluating genetically improved reforestation stock; or
3. Based on new information that is peer reviewed and accepted by the regional level of the Forest Service, and state level of FWS, where a written determination states:
    a. that a project[36] is not likely to adversely affect lynx; or
    b. that a project[36] is likely to have short term adverse effects on lynx or its habitat, but would result in long-term benefits to lynx and its habitat; or
4. For conifer removal in aspen, or daylight thinning[5] around individual aspen trees, where aspen is in decline; or
5. For daylight thinning of planted rust-resistant white pine where 80 % of the winter snowshoe hare habitat[51] is retained; or
6. To restore whitebark pine.

Standard VEG S6

Where and to what this applies: Standard VEG S6 applies to all vegetation management[49] projects[36] except for fuel treatment[13] projects[36] within the wildland urban interface[50] (WUI) as defined by HFRA[17], subject to the following limitation:

Fuel treatment projects[36] within the WUI[50] that do not meet Standards VEG S1, VEG S2, VEG S5, and VEG S6 may occur on no more than 6 percent (cumulatively) of lynx habitat on each administrative unit (a unit is a National Forest).

For fuel treatment projects[36] within the WUI[50] see guideline VEG G10.

The Standard: Vegetation management projects[36] that reduce snowshoe hare habitat in multi-story mature or late successional forests[29] may occur only:

1. Within 200 feet of administrative sites, dwellings, outbuildings, recreation sites, and special use permit improvements, including infrastructure within permitted ski area boundaries; or
2. For research studies[39] or genetic tree tests evaluating genetically improved reforestation stock; or
3. For incidental removal during salvage harvest[42] (e.g. removal due to location of skid trails).

(NOTE: Timber harvest is allowed in areas that have potential to improve winter snowshoe hare habitat but presently have poorly developed understories that lack dense horizontal cover [e.g. uneven age management systems could be used to create openings where there is little understory so that new forage can grow]).

<u>Guideline VEG G1</u>

Vegetation management[49] projects[36] should be planned to recruit a high density of conifers, hardwoods, and shrubs where such habitat is scarce or not available. Priority for treatment should be given to stem-exclusion, closed-canopy structural stage[46] stands to enhance habitat conditions for lynx or their prey (e.g. mesic, monotypic lodgepole stands). Winter snowshoe hare habitat[51] should be near denning habitat[6].

<u>Guideline VEG G4</u>

Prescribed fire[34] activities should not create permanent travel routes that facilitate snow compaction. Constructing permanent firebreaks on ridges or saddles should be avoided.

<u>Guideline VEG G5</u>

Habitat for alternate prey species, primarily red squirrel[37], should be provided in each LAU.

<u>Guideline VEG G10</u>

Fuel treatment projects[36] within the WUI[50] as defined by HFRA[17] should be designed considering Standards VEG S1, S2, S5, and S6 to promote lynx conservation.

<u>Guideline VEG G11</u>

Denning habitat[6] should be distributed in each LAU in the form of pockets of large amounts of large woody debris, either down logs or root wads, or large piles of small wind thrown trees ("jack-strawed" piles). If denning habitat appears to be lacking in the LAU, then projects[36] should be designed to retain some coarse woody debris[4], piles, or residual trees to provide denning habitat[6] in the future.

LIVESTOCK MANAGEMENT (GRAZ): The following objectives and guidelines apply to grazing projects in lynx habitat in lynx analysis units (LAUs). They do not apply to linkage areas.

Objective[30] GRAZ O1

Manage livestock grazing to be compatible with improving or maintaining[26] lynx habitat[23].

Guideline[15] GRAZ G1

In fire- and harvest-created openings, livestock grazing should be managed so impacts do not prevent shrubs and trees from regenerating.

Guideline GRAZ G2

In aspen stands, livestock grazing should be managed to contribute to the long-term health and sustainability of aspen.

Guideline GRAZ G3

In riparian areas[41] and willow carrs[3], livestock grazing should be managed to contribute to maintaining or achieving a preponderance of mid- or late-seral stages[28], similar to conditions that would have occurred under historic disturbance regimes.

Guideline GRAZ G4

In shrub-steppe habitats[43], livestock grazing should be managed in the elevation ranges of forested lynx habitat in LAUs[21], to contribute to maintaining or achieving a preponderance of mid- or late-seral stages, similar to conditions that would have occurred under historic disturbance regimes.

HUMAN USE PROJETS (HU): The following objectives and guidelines apply to human use projects, such as special uses (other than grazing), recreation management, roads, highways, and mineral and energy development, in lynx habitat in lynx analysis units (LAUs), subject to valid existing rights. They do not apply to vegetation management projects or grazing projects directly. They do not apply to linkage areas.

Objective[30] HU O1

Maintain[26] the lynx's natural competitive advantage over other predators in deep snow, by discouraging the expansion of snow-compacting activities in lynx habitat[23].

Objective HU O2

Manage recreational activities to maintain lynx habitat and connectivity[16].

Objective HU O3

Concentrate activities in existing developed areas, rather than developing new areas in lynx habitat.

Objective HU O4

Provide for lynx habitat needs and connectivity when developing new or expanding existing developed recreation[9] sites or ski areas.

Objective HU O5

Manage human activities, such as special uses, mineral and oil and gas exploration and development, and placement of utility transmission corridors, to reduce impacts on lynx and lynx habitat.

Objective HU O6

Reduce adverse highway[18] effects on lynx by working cooperatively with other agencies to provide for lynx movement and habitat connectivity[16], and to reduce the potential of lynx mortality.

Guideline[15] HU G1

When developing or expanding ski areas, provisions should be made for adequately sized inter-trail islands that include coarse woody debris[4], so winter snowshoe hare habitat[51] is maintained.

Guideline HU G2

When developing or expanding ski areas, lynx foraging habitat should be provided consistent with the ski area's operational needs, especially where lynx habitat occurs as narrow bands of coniferous forest across mountain slopes.

Guideline HU G3

Recreation developments and operations should be planned in ways that both provide for lynx movement and maintain the effectiveness of lynx habitat[23].

Guideline HU G4

For mineral and energy development sites and facilities, remote monitoring should be encouraged to reduce snow compaction.

Guideline HU G5

For mineral and energy development sites and facilities that are closed, a reclamation plan that restores[40] lynx habitat should be developed.

Guideline HU G6

Methods to avoid or reduce effects on lynx should be used in lynx habitat[23] when upgrading unpaved roads to maintenance levels 4 or 5, if the result would be increased traffic speeds and volumes, or a foreseeable contribution to increases in human activity or development.

Guideline HU G7

New permanent roads should not be built on ridge-tops and saddles, or in areas identified as important for lynx habitat connectivity[16]. New permanent roads and trails should be situated away from forested stringers.

Guideline HU G8

Cutting brush along low-speed[25], low-traffic-volume roads should be done to the minimum level necessary to provide for public safety.

Guideline HU G9

On new roads built for projects[36], public motorized use should be restricted. Effective closures should be provided in road designs. When the project[36] is over, these roads should be reclaimed or decommissioned, if not needed for other management objectives.

Guideline HU G10

When developing or expanding ski areas and trails, consider locating access roads and lift termini to maintain and provide lynx security habitat[10], if it has been identified as a need.

Guideline HU G11

Designated over-the-snow routes or designated play areas should not expand outside baseline areas of consistent snow compaction[1], unless designation serves to consolidate use and improve lynx habitat. This may be calculated on an LAU basis, or on a combination of immediately adjacent LAUs.

This does not apply inside permitted ski area boundaries, to winter logging, to rerouting trails for public safety, to accessing private inholdings, or to access regulated by Guideline HU G12.

Use the same analysis boundaries for all actions subject to this guideline.

Guideline HU G12

Winter access for non-recreation special uses and mineral and energy exploration and development, should be limited to designated routes[8] or designated over-the-snow routes[7].

LINKAGE AREAS (LINK): The following objective, standard, and guidelines apply to all projects within linkage areas, subject to valid existing rights.

Objective[30] LINK O1

In areas of intermingled land ownership, work with landowners to pursue conservation easements, habitat conservation plans, land exchanges, or other solutions to reduce the potential of adverse impacts on lynx and lynx habitat.

Standard[44] LINK S1

When highway[18] or forest highway[12] construction or reconstruction is proposed in linkage areas[22], identify potential highway crossings.

Guideline[15] LINK G1

NFS lands should be retained in public ownership.

Guideline LINK G2

Livestock grazing in shrub-steppe habitats[43] should be managed to contribute to maintaining or achieving a preponderance of mid- or late-seral stages[28], similar to conditions that would have occurred under historic disturbance regimes.

REQUIRED MONITORING

Map the location and intensity of snow compacting activities and designated and groomed routes that occurred inside LAUs during the period of 1998 to 2000. The mapping is to be completed within one year of this decision, and changes in activities and routes are to be monitored every five years after the decision.

Annually report the number of acres where any of the exemptions 1 through 6 listed in Standard VEG S5 were applied. Report the type of activity, the number of acres, and the location (by unit, and LAU[21]).

Report the acres of fuel treatment in lynx habitat within the wildland urban interface[50] as defined by HFRA[17] when the project[36] decision is approved. Report whether or not the fuel treatment met the vegetation standards. If standard(s) are not met, report which standard(s) are not met, why they were not met, and how many acres were affected.

GLOSSARY

[1] *Area of consistent snow compaction* – An area of consistent snow compaction is an area of land or water that during winter is generally covered with snow and gets enough human use that individual tracks are indistinguishable. In such places, compacted snow is evident most of the time, except immediately after (within 48 hours) snowfall. These can be areas or linear routes, and are generally found in or near snowmobile or cross-country ski routes, in adjacent openings, parks and meadows, near ski huts or plowed roads, or in winter parking areas. Areas of consistent snow compaction will be determined based on the acreage or miles used during the period 1998 to 2000.

[2] *Broad scale assessment* – A broad scale assessment is a synthesis of current scientific knowledge, including a description of uncertainties and assumptions, to provide an understanding of past and present conditions and future trends, and a characterization of the ecological, social, and economic components of an area. (LCAS)

[3] *Carr* – Deciduous woodland or shrub land occurring on permanently wet, organic soil. (LCAS)

[4] *Course woody debris* – Any piece(s) of dead woody material, e.g., dead boles, limbs, and large root masses on the ground or in streams. (LCAS)

[5] *Daylight thinning* – Daylight thinning is a form of precommercial thinning that removes the trees and brush inside a given radius around a tree.

[6] *Denning habitat (lynx)* – Denning habitat is the environment lynx use when giving birth and rearing kittens until they are mobile. The most common component is large amounts of coarse woody debris to provide escape and thermal cover for kittens. Denning habitat must be within daily travel distance of winter snowshoe hare habitat – the typical maximum daily distance for females is about three to six miles. Denning habitat includes mature and old growth forests with plenty of coarse woody debris. It can also include young regenerating forests with piles of coarse woody debris, or areas where down trees are jack-strawed.

[7] *Designated over-the-snow routes* – Designated over-the-snow routes are routes managed under permit or agreement or by the agency, where use is encouraged, either by on-the-ground marking or by publication in brochures, recreation opportunity guides or maps (other than travel maps), or in electronic media produced or approved by the agency. The routes identified in outfitter and guide permits are designated by definition; groomed routes also are designated by definition. The determination of baseline snow compaction will be based on the miles of designated over-the-snow routes authorized, promoted or encouraged during the period 1998 to 2000.

[8] *Designated route* -- A designated route is a road or trail that has been identified as open for specified travel use.

[9] *Developed recreation* – Developed recreation requires facilities that result in concentrated use. For example, skiing requires lifts, parking lots, buildings, and roads; campgrounds require roads, picnic tables, and toilet facilities.

[10] *Security habitat (lynx)* – Security habitat amounts to places in lynx habitat that provide secure winter bedding sites for lynx in highly disturbed landscapes like ski areas. Security habitat gives lynx the ability to retreat from human disturbance. Forest structures that make human access difficult generally discourage human activity in security habitats. Security habitats are most effective if big enough to provide visual and acoustic insulation and to let lynx easily move away from any intrusion. They must be close to winter snowshoe hare habitat. (LCAS)

[11] *Fire use* – Fire use is the combination of wildland fire use and using prescribed fire to meet resource objectives. (NIFC) Wildland fire use is the management of naturally ignited wildland fires to accomplish resource management objectives in areas that have a fire management plan. The use of the term wildland fire use replaces the term prescribed natural fire. (Wildland and Prescribed Fire Management Policy, August 1998)

[12] *Forest highway* – A forest highway is a forest road under the jurisdiction of, and maintained by, a public authority and open to public travel (USC: Title 23, Section 101(a)), designated by an agreement with the FS, state transportation agency, and Federal Highway Administration.

[13] *Fuel treatment* – A fuel treatment is a type of vegetation management action that reduces the threat of ignition, fire intensity, or rate of spread, or is used to restore fire-adapted ecosystems.

[14] *Goal* – A goal is a broad description of what an agency is trying to achieve, found in a land management plan. (LCAS)

[15] *Guideline* – A guideline is a particular management action that should be used to meet an objective found in a land management plan. The rationale for deviations may be documented, but amending the plan is not required. (LCAS modified)

[16] *Habitat connectivity (lynx)* – Habitat connectivity consists of an adequate amount of vegetation cover arranged in a way that allows lynx to move around. Narrow forested mountain ridges or

shrub-steppe plateaus may serve as a link between more extensive areas of lynx habitat; wooded riparian areas may provide travel cover across open valley floors. (LCAS)

[17] *HFRA (Healthy Forests Restoration Act)* - Public Law 108-148, passed in December 2003. The HFRA provides statutory processes for hazardous fuel reduction projects on certain types of at-risk National Forest System and Bureau of Land Management lands. It also provides other authorities and direction to help reduce hazardous fuel and restore healthy forest and rangeland conditions on lands of all ownerships. (Modified from Forest Service HFRA web site.)

[18] *Highway* – The word highway includes all roads that are part of the National Highway System. (23 CFR 470.107(b))

[19] *Horizontal cover* – Horizontal cover is the visual obscurity or cover provided by habitat structures that extend to the ground or snow surface primarily provided by tree stems and tree boughs, but also includes herbaceous vegetation, snow, and landscape topography.

[20] *Isolated mountain range* – Isolated mountain ranges are small mountains cut off from other mountains and surrounded by flatlands. On the east side of the Rockies, they are used for analysis instead of sub-basins. Examples are the Little Belts in Montana and the Bighorns in Wyoming.

[21] *LAU (Lynx Analysis Unit)* – An LAU is an area of at least the size used by an individual lynx, from about 25 to 50 square miles (LCAS). An LAU is a unit for which the effects of a project would be analyzed; its boundaries should remain constant.

[22] *Linkage area* – A linkage area provides connectivity between blocks of lynx habitat. Linkage areas occur both within and between geographic areas, where basins, valleys, or agricultural lands separate blocks of lynx habitat, or where lynx habitat naturally narrows between blocks. (LCAS updated definition approved by the Steering Committee 10/23/01)

[23] *Lynx habitat* – Lynx habitat occurs in mesic coniferous forest that experience cold, snowy winters and provide a prey base of snowshoe hare. In the northern Rockies, lynx habitat generally occurs between 3,500 and 8,000 feet of elevation, and primarily consists of lodgepole pine, subalpine fir, and Engelmann spruce. It may consist of cedar-hemlock in extreme northern Idaho, northeastern Washington and northwestern Montana, or of Douglas-fir on moist sites at higher elevations in central Idaho. It may also consist of cool, moist Douglas-fir, grand fir, western larch and aspen when interspersed in subalpine forests. Dry forests do not provide lynx habitat. (LCAS)

[24] *Lynx habitat in an unsuitable condition* –Lynx habitat in an unsuitable condition consists of lynx habitat in the stand initiation structural stage where the trees are generally less than ten to 30 years old and have not grown tall enough to protrude above the snow during winter. Stand replacing fire or certain vegetation management projects can create unsuitable conditions. Vegetation management projects that can result in unsuitable habitat include clearcuts and seed tree harvest, and sometimes shelterwood cuts and commercial thinning depending on the resulting stand composition and structure. (LCAS)

[25] *Low-speed, low-traffic-volume road* – Low speed is less than 20 miles per hour; low volume is a seasonal average daily traffic load of less than 100 vehicles per day.

[26] *Maintain* – In the context of this decision, maintain means to provide enough lynx habitat to conserve lynx. It does not mean to keep the status quo.

[27] *Maintenance level* – Maintenance levels define the level of service provided by and maintenance required for a road. (FSH 7709.58, Sec 12.3) Maintenance level 4 is assigned to roads that provide a moderate degree of user comfort and convenience at moderate travel speeds. Most level 4 roads have double lanes and an aggregate surface. Some may be single lane; some may be paved or have dust abated. Maintenance level 5 is assigned to roads that provide a high degree of user comfort and convenience. Normally, level 5 roads are have double lanes and are paved, but some may be aggregate surfaced with the dust abated.

[28] *Mid-seral or later* – Mid-seral is the successional stage in a plant community that is the midpoint as it moves from bare ground to climax. For riparian areas, it means willows or other shrubs have become established. For shrub-steppe areas, it means shrubs associated with climax are present and increasing in density.

[29] *Multi-story mature or late successional forest* – This stage is similar to the *old multistory structural* stage (see below). However, trees are generally not as old, and decaying trees may be somewhat less abundant.

[30] *Objective* – An objective is a statement in a land management plan describing desired resource conditions and intended to promote achieving programmatic goals. (LCAS)

[31] *Old multistory structural stage* – Many age classes and vegetation layers mark the old forest, multistoried stage. It usually contains large old trees. Decaying fallen trees may be present that leave a discontinuous overstory canopy. On cold or moist sites without frequent fires or other disturbance, multi-layer stands with large trees in the uppermost layer develop. (Oliver and Larson, 1996)

[32] *Old growth* – Old growth forests generally contain trees that are large for their species and the site, and are sometimes decadent with broken tops. Old growth often contains a variety of tree sizes, large snags, and logs, and a developed and often patchy understory.

[33] *Permanent development* – A permanent development is any development that results in a loss of lynx habitat for at least 15 years. Ski trails, parking lots, new permanent roads, structures, campgrounds, and many special use developments would be considered permanent developments.

[34] *Prescribed fire* – A prescribed fire is any fire ignited as a management action to meet specific objectives. A written, approved prescribed fire plan must exist, and NEPA requirements met, before ignition. The term prescribed fire replaces the term management ignited prescribed fire. (NWCG)

[35] *Precommercial thinning* – Precommercial thinning is mechanically removing trees to reduce stocking and concentrate growth on the remaining trees, and not resulting in immediate financial return. (Dictionary of Forestry)

[36] *Project* - All, or any part or number of the various activities analyzed in an Environmental Impact Statement, Environmental Analysis, or Decision Memo. For example, the vegetation management in some units or stands analyzed in an EIS could be for fuel reduction, and therefore those units or stands would fall within the term *fuel treatment project* even if the remainder of the activities in the EIS are being conducted for other purposes, and the remainder of those units or stands have other activities prescribed in them. All units in an analysis do not necessarily need to be for fuel reduction purposes for certain units to be considered a *fuel reduction project.*

[37] *Red squirrel habitat* – Red squirrel habitat consists of coniferous forests of seed and cone-producing age that usually contain snags and downed woody debris, generally associated with mature or older forests.

[38] *Regeneration harvest* – The cutting of trees and creating an entire new age class; an even-age harvest. The major methods are clearcutting, seed tree, shelterwood, and group selective cuts. (Helms, 1998)

[39] *Research* – Research consists of studies conducted to increase scientific knowledge or technology. For the purposes of Standards VEG S5 and VEG S6, research applies to studies financed from the forest research budget (FSM 4040) and administrative studies financed from the NF budget.

[40] *Restore, restoration* – To restore is to return or re-establish ecosystems or habitats to their original structure and species composition. (Dictionary of Forestry)

[41] *Riparian area* – An area with distinctive soil and vegetation between a stream or other body of water and the adjacent upland; includes wetlands and those portions of floodplains and valley bottoms that support riparian vegetation. (LCAS)

[42] *Salvage harvest* – Salvage harvest is a commercial timber sale of dead, damaged, or dying trees. It recovers economic value that would otherwise be lost. Collecting firewood for personal use is not considered salvage harvest.

[43] *Shrub steppe habitat* – Shrub steppe habitat consists of dry sites with shrubs and grasslands intermingled.

[44] *Standard* – A standard is a required action in a land management plan specifying how to achieve an objective or under what circumstances to refrain from taking action. A plan must be amended to deviate from a standard.

[45] *Stand initiation structural stage* – The stand initiation stage generally develops after a stand-replacing disturbance by fire or regeneration timber harvest. A new single-story layer of shrubs, tree seedlings, and saplings establish and develop, reoccupying the site. Trees that need full sun are likely to dominate these even-aged stands. (Oliver and Larson, 1996)

[46] *Stem exclusion structural stage (Closed canopy structural stage)* – In the stem exclusion stage, trees initially grow fast and quickly occupy all of the growing space, creating a closed canopy. Because the trees are tall, little light reaches the forest floor so understory plants (including smaller trees) are shaded and grow more slowly. Species that need full sunlight usually die; shrubs and herbs may become dormant. New trees are precluded by a lack of sunlight or moisture. (Oliver and Larson, 1996)

[47] *Timber management* – Timber management consists of growing, tending, commercially harvesting, and regenerating crops of trees.

[48] *Understory re-initiation structural stage* – In the understory re-initiation stage, a new age class of trees gets established after overstory trees begin to die, are removed, or no longer fully occupy their growing space after tall trees abrade each other in the wind. Understory seedlings then re-grow and the trees begin to stratify into vertical layers. A low to moderately dense uneven-aged overstory develops, with some small shade-tolerant trees in the understory. (Oliver and Larson, 1996)

[49] *Vegetation management* – Vegetation management changes the composition and structure of vegetation to meet specific objectives, using such means as prescribed fire or timber harvest. For the purposes of this decision, the term does not include removing vegetation for permanent developments like mineral operations, ski runs, roads and the like, and does not apply to fire suppression or to wildland fire use.

[50] *Wildland urban interface (WUI)* – Use the definition of WUI found in the Healthy Forests Restoration Act. The full text can be found at HFRA § 101. Basically, the wildland urban interface is the area adjacent to an at-risk community that is identified in the community wildfire protection plan. If there is no community wildfire protection plan in place, the WUI is the area 0.5 mile from the boundary of an at-risk community; or within 1.5 miles of the boundary of an at-risk community if the terrain is steep, or there is a nearby road or ridgetop that could be incorporated into a fuel break, or the land is in condition class 3, or the area contains an emergency exit route needed for safe evacuations. (Condensed from HFRA. For full text see HFRA § 101.)

[51] *Winter snowshoe hare habitat* – Winter snowshoe hare habitat consists of places where young trees or shrubs grow densely – thousands of woody stems per acre – and tall enough to protrude above the snow during winter, so snowshoe hare can browse on the bark and small twigs (LCAS). Winter snowshoe hare habitat develops primarily in the stand initiation, understory reinitiation and old forest multistoried structural stages.

Appendix O – Determination of Threatened Status for the Contiguous U.S. Distinct Population Segment of the Canada Lynx and Related Rule; Final Rule

Federal Register

Friday,
March 24, 2000

Part V

Department of the Interior

Fish and Wildlife Service

50 CFR Part 17

Endangered and Threatened Wildlife and Plants; Determination of Threatened Status for the Contiguous U.S. Distinct Population Segment of the Canada Lynx and Related Rule; Final Rule

DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

RIN 1018–AF03

Endangered and Threatened Wildlife and Plants; Determination of Threatened Status for the Contiguous U.S. Distinct Population Segment of the Canada Lynx and Related Rule

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Final rule.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), determine threatened status for the contiguous U.S. Distinct Population Segment of the Canada lynx (*Lynx canadensis*), with a special rule, pursuant to the Endangered Species Act of 1973, as amended. This population segment occurs in forested portions of the States of Colorado, Idaho, Maine, Michigan, Minnesota, Montana, New Hampshire, New York, Oregon, Utah, Vermont, Washington, and Wisconsin. The contiguous U.S. Distinct Population Segment of the lynx is threatened by the inadequacy of existing regulatory mechanisms. Current U.S. Forest Service Land and Resource Management Plans include programs, practices, and activities within the authority and jurisdiction of Federal land management agencies that may threaten lynx or lynx habitat. The lack of protection for lynx in these Plans render them inadequate to protect the species.

EFFECTIVE DATE: April 24, 2000.

ADDRESSES: The complete file for this rule is available for inspection, by appointment, during normal business hours at the Montana Field Office, U.S. Fish and Wildlife Service, 100 N. Park Avenue, Suite 320, Helena, Montana 59601.

FOR FURTHER INFORMATION CONTACT: Kemper McMaster, Field Supervisor, Montana Field Office (see **ADDRESSES** section) (telephone 406/449–5225; facsimile 406/449–5339).

Background

The Canada lynx, hereafter referred to as lynx, is a medium-sized cat with long legs; large, well-furred paws; long tufts on the ears; and a short, black-tipped tail (McCord and Cardoza 1982). Adult males average 10 kilograms (22 pounds) in weight and 85 centimeters (33.5 inches) in length (head to tail), and females average 8.5 kilograms (19 pounds) and 82 centimeters (32 inches) (Quinn and Parker 1987). The lynx's long legs and large feet make it highly adapted for hunting in deep snow.

The bobcat (*Lynx rufus*) is a North American relative of the lynx. Compared to the lynx, the bobcat has smaller paws, shorter ear tufts, and a more spotted pelage (coat), and only the top of the tip of the tail is black. The paws of the lynx have twice the surface area as those of the bobcat (Quinn and Parker 1987). The lynx also differs in its body proportions in comparison to the bobcat. Lynx have longer legs, with hind legs that are longer than the front legs, giving the lynx a "stooped" appearance (Quinn and Parker 1987). Bobcats are largely restricted to habitats where deep snows do not accumulate (Koehler and Hornocker 1991). Hybridization (breeding) between lynx and bobcat is not known (Quinn and Parker 1987).

Classification of the Canada lynx (also called the North American lynx) has been subject to revision. In accordance with Wilson and Reeder (1993), we currently recognize the lynx in North America as *Lynx canadensis*. We previously used the latin name *L. lynx canadensis* for the lynx (Jones *et al.* 1992; S. Williams, Texas Tech University, pers. comm. 1994). Other scientific names still in use include *Felis lynx* or *F. lynx canadensis* (Jones *et al.* 1986; Tumlison 1987).

The historical and present range of the lynx north of the contiguous United States includes Alaska and that part of Canada that extends from the Yukon and Northwest Territories south across the United States border and east to New Brunswick and Nova Scotia. In the contiguous United States, lynx historically occurred in the Cascades Range of Washington and Oregon; the Rocky Mountain Range in Montana, Wyoming, Idaho, eastern Washington, eastern Oregon, northern Utah, and Colorado; the western Great Lakes Region; and the northeastern United States region from Maine southwest to New York (McCord and Cardoza 1982; Quinn and Parker 1987) (see "Distribution and Status" section).

In the contiguous United States, the distribution of the lynx is associated with the southern boreal forest, comprising of subalpine coniferous forest in the West and primarily mixed coniferous/deciduous forest in the East (Aubry *et al.* 1999) (see "Distribution and Status" section); whereas in Canada and Alaska, lynx inhabit the classic boreal forest ecosystem known as the taiga (McCord and Cardoza 1982; Quinn and Parker 1987; Agee 1999; McKelvey *et al.* 1999b). Within these general forest types, lynx are most likely to persist in areas that receive deep snow, for which the lynx is highly adapted (Ruggiero *et al.* 1999b).

We consider lynx in the contiguous United States to be part of a larger metapopulation whose core is located in the northern boreal forest of central Canada; lynx populations emanate from this area (Buskirk *et al.* 1999b; McKelvey *et al.* 1999a, 1999b). The boreal forest extends south into the contiguous United States along the Cascade and Rocky Mountain Ranges in the West, the western Great Lakes Region, and along the Appalachian Mountain Range of the northeastern United States. At its southern margins, the boreal forest becomes naturally fragmented into patches of varying size as it transitions into other vegetation types. These southern boreal forest habitat patches are small relative to the extensive northern boreal forest of Canada and Alaska, which constitutes the majority of the lynx range.

Many of these southern boreal forest habitat patches within the contiguous United States are able to support resident populations of lynx and their primary prey species. It is likely that some of the habitat patches act as sources of lynx (recruitment is greater than mortality) that are able to disperse and potentially colonize other patches (McKelvey *et al.* 1999a). Other habitat patches act as "sinks" where lynx mortality is greater than recruitment and lynx are lost from the overall population. The ability of naturally dynamic habitat to support lynx populations may change as the habitat undergoes natural succession following natural or manmade disturbances (*i.e.*, fire, clearcutting). In addition, fluctuations in the prey populations may cause some habitat patches to change from being sinks to sources and vice versa. Throughout this document, we use the term "resident population" to refer to a group of lynx that has exhibited long-term persistence in an area based on a variety of factors, such as evidence of reproduction, successful recruitment into the breeding cohort, and maintenance of home ranges. We use the word "transient" to refer to a lynx moving from one place to another within suitable habitat. Another word we use throughout the document is "dispersing," which refers to lynx that have left suitable habitat for various reasons, such as competition or lack of food. When dispersing lynx leave suitable habitat and enter habitats that are unlikely to sustain lynx, these individuals are considered lost from the metapopulations unless they return to boreal forest.

Lynx use large woody debris, such as downed logs and windfalls, to provide

denning sites with security and thermal cover for kittens (McCord and Cardoza 1982; Koehler 1990; Koehler and Brittell 1990; Squires and Laurion 1999; J. Organ, U.S. Fish and Wildlife Service, *in litt.* 1999). For lynx den sites, the age of the forest stand does not seem as important as the amount of downed, woody debris available (Mowat *et al.* 1999). In Washington, lynx used *Pinus contorta* (lodgepole pine), *Picea* spp. (spruce), and *Abies lasiocarpa* (subalpine fir) forests older than 200 years with an abundance of downed woody debris for denning (Koehler 1990). A den site in Wyoming was located in a mature subalpine fir/ lodgepole pine forest with abundant downed logs and a high amount of horizontal cover (Squires and Laurion 1999). A lynx den site found in Maine in 1999 was located in a forest stand in *Picea rubra* (red spruce) cover type that was logged in 1930 and again in the 1980s (J. Organ, *in litt.* 1999). The site is regenerating into hardwoods and has a dense understory (J. Organ, *in litt.* 1999). The dominant feature of the Maine site was the abundance of dead and downed wood (J. Organ, *in litt.* 1999).

The size of lynx home ranges varies by the animal's gender, abundance of prey, season, and the density of lynx populations (Hatler 1988; Koehler 1990; Poole 1994; Slough and Mowat 1996; Aubry *et al.* 1999; Mowat *et al.* 1999). Documented home ranges vary from 8 to 800 square kilometers (3 to 300 square miles) (Saunders 1963; Brand *et al.* 1976; Mech 1980; Parker *et al.* 1983; Koehler and Aubry 1994; Apps 1999; Mowat *et al.* 1999; Squires and Laurion 1999). Preliminary research supports the hypothesis that lynx home ranges at the southern extent of the species' range are generally large compared to those in the northern portion of the range in Canada (Koehler and Aubry 1994; Apps 1999; Squires and Laurion 1999).

Lynx are highly specialized predators whose primary prey is the snowshoe hare (*Lepus americanus*), which has evolved to survive in areas that receive deep snow (Bittner and Rongstad 1982). Snowshoe hares use forests with dense understories that provide forage, cover to escape from predators, and protection during extreme weather (Wolfe *et al.* 1982; Monthey 1986; Hodges 1999a,1999b). Generally, earlier successional forest stages have greater understory structure than do mature forests and therefore support higher hare densities (Hodges 1999a,1999b). However, mature forests can also provide snowshoe hare habitat as openings develop in the canopy of mature forests when trees succumb to disease, fire, wind, ice, or insects, and the understory grows (Buskirk *et al.* 1999b). Lynx concentrate their hunting activities in areas where hare activity is relatively high (Koehler *et al.* 1979; Parker 1981; Ward and Krebs 1985; Major 1989; Murray *et al.* 1994; O'Donoghue *et al.* 1997, 1998a).

The association between lynx and snowshoe hare is considered a classic predator-prey relationship (Saunders 1963; van Zyll de Jong 1966; Quinn and Parker 1987). In northern Canada and Alaska, lynx populations fluctuate on approximately 10-year cycles that follow the cycles of hare populations (Elton and Nicholson 1942; Hodges 1999a, 1999b; McKelvey *et al.* 1999b). Generally, researchers believe that when hare populations are at their cyclic high, depletion of food resources exacerbated by predation cause hare populations to decline drastically (Buehler and Keith 1982; Krebs *et al.* 1995; O'Donoghue *et al.* 1997). Snowshoe hare provide the quality prey necessary to support high-density lynx populations (Brand and Keith 1979). Lynx also prey opportunistically on other small mammals and birds, particularly when hare populations decline (Nellis *et al.* 1972; Brand *et al.* 1976; McCord and Cardoza 1982; O'Donoghue 1997, 1998a). Red squirrels (*Tamiasciurus hudsonicus*) are an important alternate prey (O'Donoghue 1997;1998a; Apps 1999; Aubry *et al.* 1999). In the Yukon, lynx shifted to red squirrels when hare numbers began to decline (O'Donoghue 1998a, 1998b). However, a shift to alternate food sources may not compensate for the decrease in hares consumed (Koehler and Aubry 1994). In northern regions, when hare densities decline, the lower quality diet causes sudden decreases in the productivity of adult female lynx and decreased survival of kittens, which causes the numbers of breeding lynx to level off or decrease (Nellis *et al.* 1972; Brand *et al.* 1976; Brand and Keith 1979; Poole 1994; Slough and Mowat 1996; O'Donoghue *et al.* 1997).

Relative densities of snowshoe hares at southern latitudes are generally lower than those in the north, which has led to differing interpretations of the population dynamics of snowshoe hare populations. At southern latitudes hare populations may be—(1) noncyclic, (2) cyclic like northern populations, (3) cyclic with the high and low population numbers closer to the average population numbers, or (4) cyclic with a fluctuating periodicity (length of time between peaks and lows) (Dolbeer and Clark 1975; Wolff 1980; Buehler and Keith 1982; Brittell *et al.* 1989; Koehler 1990; Koehler and Aubry 1994; Hodges 1999b). Hodges (1999b) proposes that northern and southern hare populations have similar cyclic dynamics but that in southern areas both peak and low densities are lower than in the north. Snowshoe hares are generally associated with conifer forest cover types (Hodges 1999b). Relatively low snowshoe hare densities at southern latitudes are likely a result of the naturally patchy, transitional boreal habitat at southern latitudes that prevents hare populations from achieving densities similar to those of the expansive northern boreal forest (Wolff 1980; Buehler and Keith 1982; Koehler 1990; Koehler and Aubry 1994). Additionally, the presence of more predators and competitors of hares at southern latitudes may inhibit the potential for high-density hare populations with extreme cyclic fluctuations (Wolff 1980). If snowshoe hare populations in southern boreal forests do fluctuate (Hodges 1999b), then southern lynx populations also may be expected to fluctuate.

Therefore, lynx densities at the southern part of the range never achieve the high densities that occur in the northern boreal forest (Aubry *et al.* 1999). Comparisons between Canadian and contiguous U.S. lynx harvest returns and snowshoe hare densities over time suggest lynx numbers and snowshoe hare densities for the contiguous United States are substantially lower than those for Canadian provinces (Hodges 1999a, 1999b; McKelvey *et al.* 1999b). We conclude that historic and current lynx densities in the contiguous United States also are naturally low relative to lynx densities in the northern boreal forest.

Researchers believe cyclic increases in historic lynx harvest numbers in the contiguous United States were augmented by dispersal of transient animals from Canadian populations (Gunderson 1978; Henderson 1978; Mech 1980; McKelvey *et al.* 1999b). The opinion of some individuals and agencies is that presence of lynx in some regions of the contiguous United States, particularly the Great Lakes, is solely a consequence of dispersal from Canada (G. Meyer, Wisconsin Department of Natural Resources, *in litt.* 1998; R. Sando, Minnesota Department of Natural Resources, *in litt.* 1998). Lynx are capable of dispersing extremely long distances (Mech 1977; Brainerd 1985; Washington Department of Wildlife 1993); for example, a male was documented traveling 616 kilometers (370 miles) (Brainerd 1985). Lynx disperse primarily when snowshoe hare populations decline (Ward and Krebs 1985; Koehler and Aubry 1994;

O'Donoghue *et al.* 1997; Poole 1997). Subadult lynx disperse even when prey is abundant (Poole 1997), presumably as an innate response to establish home ranges. An extreme example of the apparent emigration of lynx from Canada to the contiguous United States is the numerous occurrences of lynx that were frequently documented in atypical habitat, such as in North Dakota, during the early 1960s and 1970s. In these years harvest returns indicated unprecedented cyclic lynx highs for the 20th century in Canada (Adams 1963; Harger 1965; Mech 1973; Gunderson 1978; Thiel 1987; McKelvey *et al.* 1999b). We believe that many of these animals were dispersing and were either lost from the population because they were in areas that are unable to support lynx or they were able to return to suitable habitat.

Distribution and Status

The complexities of lynx life-history and population dynamics, combined with a general lack of reliable historic or current lynx data for the contiguous United States, make it difficult for us to ascertain the past or present population status of lynx in the contiguous United States. Lynx population dynamics in the contiguous United States may not be the same as in the northern boreal forests of Canada and Alaska. Regarding lynx in the northern boreal forests of Canada and Alaska, we know the following—northern lynx populations undergo extreme fluctuations in response to snowshoe hare population cycles; lynx disperse when hare populations decline; lynx are capable of dispersing long distances; recruitment of young into the population seems to cease during cyclic lows of snowshoe hare populations; and lynx maintain home ranges (Mowat *et al.* 1999). We do not know the extent to which the northern lynx populations influence lynx occurrence in the contiguous United States. Because of the naturally fragmented habitat and lower density hare populations in the contiguous United States, we expect lynx in the contiguous United States to occur at naturally lower densities than in the north.

Historic lynx data in the contiguous United States are scarce and exist primarily in the form of trapping records. Many States did not differentiate between bobcats and lynx in trapping records, referring to both as "lynxcats." Therefore, long-term lynx trapping data is not available for most States. Surveys designed specifically for lynx were rarely conducted, and many reports (*e.g.*, visual observations, snow tracks) of lynx were collected incidental to other activities. The reliability of many of these records is unknown; trapping records may have errors, track identification is extremely difficult, and observations may be wrong. Long-term trapping data have been used to understand population trends for various species; however, because trapper effort can change, trapping returns may not accurately reflect population trends. Data showing few lynx trapped could be a result of decreased trapper effort, not necessarily a decreased population. These factors hamper our understanding of lynx population dynamics and status in the contiguous United States and preclude us from drawing definitive conclusions about lynx population trends. Data are too incomplete to infer much beyond simple occurrence (McKelvey *et al.* 1999b) and distribution of lynx in the contiguous United States. However, despite these difficulties, trapping data is the best information available on lynx presence throughout much of its range in the contiguous United States and therefore was relied upon in our analysis.

Data that would help us determine whether resident populations of lynx existed historically or exist currently in many States are generally unavailable. Given the available data and the propensity of lynx to disperse, at this time it is impossible to determine with certainty whether reports of lynx in many States were—(1) merely dispersing animals from northern populations that were effectively lost from the metapopulation because they did not join or establish resident populations, (2) animals that were a part of a resident population that persisted for many generations, or (3) a mixture of both members of resident populations and dispersing animals.

There are several plausible explanations for a lack of lynx records, such as (1) the true absence of lynx, (2) lynx populations are at a cyclic low, (3) lack of adequate surveys, or (4) decreased trapper effort. We suspect that some areas in the contiguous United States naturally act as "sinks" for lynx where mortality is higher than recruitment and lynx are lost from the overall population (McKelvey *et al.* 1999a). Sink habitats are most likely those places on the periphery of the southern boreal forest in the contiguous United States where habitat becomes more fragmented and more distant from larger lynx populations.

In the following discussions, we describe available lynx data, habitat, and other elements that frame our understanding of lynx in the various regions and States where lynx have been reported within the contiguous United States.

Within the contiguous United States, the lynx range extends into different regions that are separated from each other by ecological barriers consisting of unsuitable lynx habitat. These regions are the Northeast, the Great Lakes, the Northern Rocky Mountains/Cascades, and the Southern Rocky Mountains. In general, lynx in each of these regions are associated with habitats that are southern extensions of the boreal forest (Aubry *et al.* 1999). Differences in local climate, primarily precipitation, and effects of elevation have resulted in climax forest types that differ in the eastern regions compared to the West (Buskirk *et al.* 1999b). The climax forest in the East is primarily deciduous or mixed deciduous/coniferous whereas in the West the climax forest is coniferous (Buskirk *et al.* 1999b). While the four regions of lynx range in the contiguous United States are ecologically unique and discreet, in each of these regions the lynx is associated with the southern boreal forest and, with the exception of the Southern Rockies, they are each geographically connected to the much larger population of lynx in Canada. For a more detailed description of the significance of each region within the overall U.S. population, see the "Distinct Population Segment" section.

Northeast Region—Based on an analysis of cover types and elevation zones containing most of the lynx occurrences, McKelvey *et al.* (1999b) determined that, at the broad scale, most lynx occurrence records in the Northeast were found within the "Mixed Forest-Coniferous Forest-Tundra" cover type at elevations ranging from 250 to 750 meters (820 to 2,460 feet). This habitat type in the northeast U.S. occurs along the northern Appalachian Mountain range from southeastern Quebec, western New Brunswick, and western Maine, south through northern New Hampshire. This habitat type becomes naturally more fragmented and begins to diminish to the south and west, with a disjunct segment running north-south through Vermont, an extensive patch of habitat in the Adirondacks of northern New York, and with a few more distant and isolated patches in Pennsylvania (see Figure 8.23 in McKelvey *et al.* 1999b). Within this habitat type, the highest frequency of lynx occurrences were in the *Picea rubens* (red spruce), *Abies balsamea* (balsam fir), *Acer saccharum* (sugar maple), *Betula* spp. (birch), *Fagus grandifolia* (beech) forest (McKelvey *et al.* 1999b).

The entire region south of the St. Lawrence River must be considered in

an assessment of lynx in the northeastern United States. Movement of lynx across the St. Lawrence River is believed to occur infrequently (R. Lafond, Quebec Ministry of the Environment, pers. comm. 1999); therefore, emigration from lynx populations of northern Quebec to the region south of the St. Lawrence River is limited. However, northeastern U.S. lynx and snowshoe hare habitat and populations are contiguous with those south of the St. Lawrence River in southeastern Quebec and western New Brunswick and, presumably, together constitute a metapopulation. Lynx should encounter little difficulty moving between southeastern Quebec and Maine and New Hampshire, because habitat is continuous and without barriers. In this region, we conclude the core of lynx habitat historically was found in western Maine, northern New Hampshire, southeastern Quebec, and western New Brunswick.

Harvest records from southeastern Quebec provide evidence that lynx persist in this region. Quebec instituted a lynx management plan requiring that trapping seasons for lynx be closed for 3 years during the lows in the cycles; most recently these seasons were closed during 1995, 1996, and 1997 (Environment et faune Quebec 1995). Outside of these closed seasons, harvest returns in the 1990s ranged from 100 (in 1990 and 1993) to nearly 275 (in 1998) (R. Lafond, *in litt.* 1999). In New Brunswick, the lynx has been listed as endangered since 1982; during 1996 revisions, it was categorized as a "regionally endangered species" (Cumberland *et al.* 1998). Although the lynx harvest season in New Brunswick has been closed, lynx were incidentally caught throughout the 1990s, evidence of the continued occurrence of lynx in New Brunswick (Cumberland *et al.* 1998).

Maine—In Maine, lynx accounts are irregular and anecdotal (McKelvey *et al.* 1999b; Maine Department of Inland Fisheries and Wildlife, *in litt.* 1997; R. Joseph, U.S. Fish and Wildlife Service, *in litt.* 1999). Twenty-eight verified records exist for Maine since 1862 (McKelvey *et al.* 1999b). Anecdotal information plus historical and recent records provide evidence of presence, reproduction, and persistence of lynx in several northern and western townships (R. Joseph, *in litt.* 1999), indicating the historical residency of lynx. Lynx had a bounty placed on them in Maine from 1832 to the closure of hunting and trapping seasons in 1967. Maine classifies lynx as a species of special concern (Matula 1997), and currently hunting or trapping seasons for lynx are closed.

Although no reliable population estimates exist, in 1994 it was suggested that 200 animals or fewer occur Statewide (Maine Department of Inland Fisheries and Wildlife 1994). Lynx tracks were detected during track surveys in the 1990s (Maine Department of Inland Fisheries and Wildlife, *in litt.* 1997, 1998). In 1999, Maine and Service biologists radio-collared six lynx, three adult males and three adult females, and recorded two sub-adults and two kittens associated with radio-collared adults. This finding established with certainty current reproduction in Maine (J. Organ, *in litt.* 1999) and indicates the existence of a resident population. However, available data are not adequate for determining either population trend (increasing or decreasing) or size.

New Hampshire—New Hampshire is the only northeastern State that maintained a record of historic lynx harvest (Orff 1985 *in* McKelvey *et al.* 1999b; see Figure 8.1 *in* McKelvey *et al.* 1999b). Lynx were intermittently bountied in New Hampshire until 1965. Most of the lynx harvest occurred in the 1930s, ranging from 1 to 20 per year. Between 1940 and 1964, lynx harvests were lower, ranging from 0 to 3 lynx being caught per year. For 11 years, the harvest was zero (McKelvey *et al.* 1999b). The trapping season was closed in 1964 in response to apparent declines in lynx abundance reflected in harvest returns (Siegler 1971; Silver 1974; Litvaitis *et al.* 1991). Since 1980, the lynx has been listed as an endangered species by the New Hampshire Department of Fish and Game. Winter track surveys in 1986 in portions of the White Mountain National Forest did not detect lynx (Litvaitis *et al.* 1991). Litvaitis *et al.* (1991) hypothesized that lynx were extirpated from New Hampshire as increasing agriculture and timber harvesting in the 1970s precluded them from dispersing into the State from southeastern Quebec. Only two reports of lynx in New Hampshire exist for the 1990s (M. Amaral, U.S. Fish and Wildlife Service, *in litt.* 1999). Although lynx reports are scarce, to our knowledge, no lynx surveys have been completed in New Hampshire in recent years. Therefore, we suspect that lynx are present in New Hampshire because habitat remains contiguous with Maine.

Vermont—In Vermont, only four verified records of historic lynx occurrence exist (McKelvey *et al.* 1999b). In the mid-1900s, it was reported that Vermont had not had a documented breeding population of lynx for several decades (Osgood 1938 *in* Vermont Department of Fish and Wildlife 1987). In fact, we have no evidence of a breeding population ever occurring in Vermont. Since 1972, the lynx has been listed by the State as endangered. The last verified occurrence was from 1968, with periodic reports since then. Vermont naturally supports less lynx habitat than we previously presumed, based on analyses by McKelvey *et al.* (1999b). Furthermore, lynx habitat in Vermont is somewhat isolated from that in New Hampshire. The State of Vermont currently considers lynx to be extirpated (A. Elser, Vermont Department of Fish and Wildlife, *in litt.* 1998). Therefore, we conclude that lynx occurrence in Vermont is poorly documented, and, based upon the limited extent and dispersed nature of suitable habitat, lynx were probably never abundant or persistent over time. Currently, lynx are not thought to occur in Vermont.

New York—Historically, lynx reportedly occurred in most northern regions of New York, particularly in the Adirondack Mountains and the Catskill Mountains (McKelvey *et al.* 1999b; K. Gustafson, pers. comm. 1994). Miller (1899 *in* Brocke 1982) believed that, by the 1880s, the population was approaching extirpation. McKelvey *et al.* (1999b) found 23 verified lynx occurrences since 1900, primarily from the Adirondack Mountains. The most recent verified record was from 1973 (McKelvey *et al.* 1999b). Historically, the Adirondacks apparently supported lynx habitat, although it was isolated from habitats and lynx populations to the north.

An effort to reintroduce lynx into the Adirondack Mountains occurred during 1988–1990 (Brocke *et al.* 1990; D. Major, U.S. Fish and Wildlife Service, pers. comm. 1998), but the reintroduction is believed to have failed. A collared lynx from the reintroduction effort was found near Ottawa, Ontario, Canada (M. Amaral, U.S. Fish and Wildlife Service, pers. comm. 1997) and another as far away as northern New Jersey (K. Gustafson, New Hampshire Fish and Game Department, pers. comm. 2000). No verified occurrences in New York have been reported recently. In New York, lynx are legally classified as a small game species with a closed season. We conclude the lynx is extirpated from New York.

Pennsylvania/Massachusetts—In the proposed rule, Pennsylvania and Massachusetts were considered to be a part of the historic range of lynx. However, the inherent isolation and small sizes of habitat patches both currently and historically, combined with the few accounts of lynx occurrence in these States, led us to

conclude that lynx were merely dispersing animals in these States (J. Belfonti, The Nature Conservancy, *in litt.* 1994). Without the habitat and prey to support lynx, we concluded that these animals were lost from the gene pool and that Pennsylvania and Massachusetts were not within the historic range of lynx.

In summary, we have firm documentation that lynx occur in Maine and that they are reproducing. We conclude that a resident lynx population historically occurred and currently occurs in Maine. Lynx historically occurred in New Hampshire, but recent records of lynx occurrence in New Hampshire are rare. Suitable habitat exists contiguous to Maine. Historically, Vermont and New York have had relatively few records of lynx and none exist from the 1990s, with the exception of animals introduced into New York. It is possible that lynx have been extirpated from New Hampshire, Vermont, and New York. We no longer include Pennsylvania and Massachusetts within the historic range of lynx because these States are isolated from resident populations and lack suitable habitat. Therefore, we concluded that the low number of lynx occurrence records represented dispersing animals that were likely lost from the population.

We conclude, based on documentation of lynx reproduction and individual animals in Maine, the substantive lynx harvest in southeastern Quebec, and the connectivity of boreal forest south of the St. Lawrence River in Quebec, New Brunswick, Maine, and New Hampshire, that in the Northeast a population of lynx continues to exist in the core of the region in the north; however, the range appears to have retracted northward. Connectivity with lynx populations north of the St. Lawrence River in Canada has been reduced from historic levels because of development along the St. Lawrence River and ice breaking to allow year-round shipping.

Great Lakes Region—The majority of lynx occurrence records in the Great Lakes Region are associated with the "mixed deciduous-coniferous forest" type (McKelvey *et al.* 1999b). Within this general forest type, the highest frequency of lynx occurrences were in the *Acer saccharum* (sugar maple), *Tilia* spp. (basswood), *Pinus banksiana* (jack pine), *P. strobus* (white pine), and *P. resinosa* (red pine) forest types (McKelvey *et al.* 1999b). These types are found primarily in northeastern Minnesota, northern Wisconsin, and the western portion of Michigan's upper peninsula.

Although the mixed deciduous-coniferous forest covers an extensive area in this region, we consider much of this area to be marginal habitat for lynx because it is a transitional forest type at the edge of the snowshoe hare range. Habitat at the edge of hare range supports lower hare densities (Buehler and Keith 1982) that may not be sufficient to support lynx reproduction. Furthermore, snow depths within appropriate habitat that allow lynx a competitive advantage over other carnivores (*i.e.*, coyotes (*Canis latrans*)) occur only in limited areas in northeastern Minnesota, extreme northern Wisconsin, and Michigan's upper peninsula.

The historic and current status of lynx in the Great Lakes Region is uncertain. Minnesota has a substantial number of lynx reports, primarily trapping records (McKelvey *et al.* 1999b), as expected because of the connectivity of the boreal forest with that of Ontario, Canada, where lynx occur. Wisconsin and Michigan have substantially fewer records of lynx (McKelvey *et al.* 1999b). Researchers have debated whether lynx in this region are simply dispersing lynx emigrating from Canada, are members of a resident population, or are a combination of a resident population and dispersing individuals (McKelvey *et al.* 1999b; R. Sando, Minnesota Department of Natural Resources, *in litt.* 1998). In recent decades, lynx dynamics in the Great Lakes appear to have been driven by immigration because lynx occurrence records did not show a response to local cycles of hare abundance (McKelvey *et al.* 1999b), as would have been expected of a resident lynx population. Available information, does not indicate that resident populations exist, but it does indicate that recent cyclic highs in the Great Lakes lynx data are at least partially Canadian in origin (McKelvey *et al.* 1999b).

Minnesota—The majority of lynx occurrence records are from the northeastern portion of the State; however, dispersing lynx have been found throughout Minnesota outside of typical lynx habitat (Gunderson 1978; Mech 1980; McKelvey *et al.* 1999b). Until 1965, lynx had a bounty placed on them in Minnesota. In 1976, the lynx was classified as a game species, and harvest seasons were established (M. DonCarlos, Minnesota Department of Natural Resources, *in litt.* 1994). Harvest and bounty records for Minnesota are available since 1930. Approximate 10-year cycles are apparent in the data, with highs in the lynx cycle in 1940, 1952, 1962, and 1973 (Henderson 1978; McKelvey *et al.* 1999b). During a 47-year period (1930–1976), the Minnesota lynx harvest was substantial, ranging from 0 to 400 per year (Henderson 1978). These harvest returns for Minnesota are believed to be influenced by influxes from Canada, particularly in recent decades (Henderson 1978; Mech 1980; McKelvey *et al.* 1999b; M. DonCarlos, *in litt.* 1994). When an anticipated lynx cyclic high for the early 1980s did not occur, the harvest season was closed in 1984 (M. DonCarlos, *in litt.* 1994) and remains closed today. Outside of harvest data, 76 verified lynx records exist for Minnesota (McKelvey *et al.* 1999b).

With available data, we cannot verify whether a resident population existed historically in Minnesota. Reproduction and maintenance of home ranges by lynx was documented in the early 1970s (Mech 1973, 1980), which may be evidence of the existence of a resident population. The early 1970s also were a period when the second highest lynx harvest returns in the 20th century occurred throughout Canada. High numbers of lynx trapped in Minnesota during this period were likely due in part to immigrants from Canada (McKelvey *et al.* 1999b). Lynx were consistently trapped over 40 years during cyclic lows, which may indicate that a small resident population occurred historically.

Current information is insufficient to determine whether a resident population of lynx exists in Minnesota and, if so, whether there has been a decline in numbers. In northeastern Minnesota, where deep snow accumulates, suitable lynx and snowshoe hare habitat is likely present. Much of this area is protected as designated wilderness, including the Boundary Waters Canoe Area. Furthermore, these habitats are contiguous with boreal forest in southern Ontario. Trapping records for Ontario districts adjacent to the Minnesota border demonstrate consistent occurrence of lynx in the area over the past 10 years (N. Dawson, Ontario Ministry of Natural Resources, *in litt.* 1999). The only recent verified records of lynx in Minnesota were two lynx in 1992 and one in 1993 (M. DonCarlos, *in litt.* 1994). However, no lynx surveys or research have been conducted in Minnesota to document presence, absence, or population trend. A lynx survey was initiated this year as a joint effort by the Service, the Forest Service and the University of Minnesota. Although habitat and prey conditions appear suitable in the northeastern portion of the State, we have received no information that

substantiates presence of a resident lynx population currently in Minnesota.

Wisconsin—Thiel (1987) concluded that, historically, Wisconsin did not support a permanent, self-sustaining lynx population; rather, lynx presence was associated with cyclic lynx population fluctuations in Canada resulting in increased dispersal. Verified reports of lynx in Wisconsin are few (29 records from 1870 to 1992) (McKelvey *et al.* 1999b); over half of these reports are associated with unprecedented cyclic highs that occurred throughout Canada in the early 1960s and 1970s. Between 1948 and 1956, 19 lynx were harvested in the State; annual harvests were low, ranging from 0 (in 1954) to 4 (in 1952) (Wisconsin Department of Natural Resources 1993). In 1992, two lynx mortalities were reported in Wisconsin (Wydeven 1993; C. Pils, *in litt.* 1994). Lynx tracks have been detected during wolf surveys in the 1990s (Wydeven 1998).

A bounty on lynx existed until 1957. Lynx were placed on the protected species list in 1957 and were classified as State endangered in 1972 (C. Pils, *in litt.* 1994). Because of the lack of breeding records, Wisconsin reclassified the lynx as a "protected" species with a closed season (G. Meyer, *in litt.* 1998).

We have no evidence to determine whether a lynx population resided in Wisconsin historically or resides currently; however, Wisconsin Department of Natural Resources suggested that a breeding population may have existed in the State prior to the 1900s (G. Meyer, *in litt.* 1998). Most of northern Wisconsin forests are mixed deciduous-coniferous forest (McKelvey 1999b). We believe this transitional forest type at the edge of the snowshoe hare range may be unable to support hare densities sufficient to sustain a resident lynx population. An exception may be in extreme northern portions of Wisconsin, where more suitable habitat exists and deep snows accumulate.

Michigan—In Michigan, historical reports suggest that the Canada lynx was resident and widespread throughout the upper and lower peninsula in the 19th century (Harger 1965). However, records verifying these accounts are scarce; 44 verified records exist from the mid 1800s until 1983 (McKelvey *et al.* 1999b). Lynx were believed extirpated from Michigan's lower peninsula in 1928, and by 1938 they were considered rare or extinct throughout the State (Harger 1965). Lynx persisted on Isle Royale in Lake Superior into the late 1970s (Peterson 1977 *in* Baker 1983; M. Romanski, Isle Royale National Park, *in litt.* 1998). Sixteen of 44 verified lynx records for Michigan are associated with an extreme cyclic high in Canada in the early 1960s (Harger 1965; McKelvey *et al.* 1999b). Only two verified records of lynx exist for Michigan (from the upper peninsula) since the 1960s (McKelvey *et al.* 1999b; G. Burgoyne, Jr., Michigan Department of Natural Resources, *in litt.* 1998). Michigan listed the lynx as "rare" in 1974; in 1983 it was listed as threatened and in 1987, its status was upgraded to endangered (G. Burgoyne, Jr., *in litt.* 1998). Although suitable habitat and snow depths likely exist in Michigan's upper peninsula, too few records exist to substantiate either the historic or current presence of a resident lynx population in Michigan.

In summary, using the best available information we cannot determine whether resident lynx populations occur currently or historically in the Great Lakes Region. Within this region, we consider northeastern Minnesota to be most likely to support a resident lynx population based on the presence of boreal forest that is contiguous with that of Ontario, where lynx are known to exist, and the number of lynx records from this area. We suspect that there may have been a small resident population historically in northeastern Minnesota; however, we recognize the lack of evidence to clearly support either the past or current existence of a resident population in Minnesota. Because of the paucity of records from Wisconsin and Michigan and the presence of habitat that we think is marginal for lynx, we suspect records of lynx in Wisconsin and Michigan most likely are transient animals that are dispersing, rather than individuals from resident populations. Accurate mapping of lynx habitat in the Great Lakes Region would enable us to define where to expect resident lynx to occur in this region.

Northern Rocky Mountain/Cascades Region—In this region, the majority of lynx occurrences are associated at a broad scale with the "Rocky Mountain Conifer Forest"; within this type, most of the occurrences are in moist *Pseudotsuga menziesii* (Douglas fir) and western spruce/fir forests (McKelvey *et al.* 1999b). Most of the lynx occurrences are in the 1,500–2,000 meters (4,920–6,560 feet) elevation class (McKelvey *et al.* 1999b). These habitats are found in the Rocky Mountains of Montana, Idaho, eastern Washington, and Utah and the Cascade Mountains in Washington and Oregon. The majority of verified lynx occurrences in the U.S. and the confirmed presence of resident populations are from this region. The boreal forest of Washington, Montana, and Idaho is contiguous with that in adjacent British Columbia and Alberta, Canada.

Washington—In Washington, resident lynx populations were historically found in the northeast and north-central regions and along the east slope of the Cascade Mountains (Washington Department of Wildlife 1993). Records of lynx exist from the Mount Rainier National Park area in the central Cascades, south in the Cascades nearly to the Oregon border on Mount Adams, and in the Blue Mountains in southeastern Washington (Taylor and Shaw 1927 *in* Koehler and Aubry 1994; Dalquest 1948; Washington Department of Natural Resources 1996a). Washington has a long record of verified lynx occurrences over the past century (McKelvey *et al.* 1999b).

Trapping data kept since 1961 reflect cyclic patterns (McKelvey *et al.* 1999b). The largest harvests were taken in 1969–1970 (31 lynx) and 1976–1977 (39 lynx) (Washington Department of Wildlife 1993). Trapping restrictions were implemented in 1977–1978, and lynx hunting and trapping seasons were closed in 1991 (Washington Department of Wildlife 1993). In the years 1987–1989, immediately prior to the season being closed, harvest increased substantially despite restrictive quotas and shortened seasons (see Figure 8.7 *in* McKelvey *et al.* 1999b). We suspect that this increase in trapped animals may have represented a cyclic increase, as was evident in harvest data from British Columbia during this time frame (see Figure 8.6 *in* McKelvey *et al.* 1999b; M. Badry, British Columbia Ministry of Environment, *in litt.* 1999). Lynx harvest data from British Columbia demonstrate cyclic fluctuations for the past 13 seasons, as well as the continued presence of lynx, in regions contiguous with Washington (M. Badry, *in litt.* 1999).

Established snow track survey routes are conducted to detect the presence of lynx within the six designated "Lynx Management Zones" across the north-central part of Washington (Richardson 1999; Washington Department of Natural Resources 1996a). Results of these surveys show that currently, lynx occupy four of these zones—Okanogan, Kettle Range, Little Pend Oreille, and Salmo Priest—but have not documented lynx presence in the Wedge or Vulcan Mountain, the two smallest zones delineated in Washington (Richardson 1999). Recent preliminary DNA survey results indicate the presence of lynx in the southern and central Cascades in Washington (Weaver and Amato 1999), and recent records of lynx reproduction also exist for Washington in the northern Cascades (Koehler 1990;

Friends of the Loomis Forest, *in litt.* 1999).

Although Washington has the best lynx data in the contiguous U.S., we cannot identify population changes or trend from this data. It is clear that resident lynx populations exist in Washington. The lynx population in Washington has been roughly estimated at 96–191 (Washington Department of Wildlife 1993) and 225 individuals (Brittell *et al.* 1989). However, these population estimates may be high because of assumed similar habitat suitability and lynx densities across the range, which is not the case (Washington Department of Wildlife 1993). Since 1993, the lynx has been listed as a State threatened species (Washington Department of Wildlife 1993). Richardson (1999) recommended retaining the lynx as a threatened species in the State because the status of the lynx had not changed appreciably in Washington.

Oregon—Historic lynx records exist from nine counties in Oregon (Bailey 1936; Nellis 1971). McKelvey (1999b) documented 12 verified lynx records for Oregon in the past century. Based on the time frames when collected and locations in atypical habitat, some of these records likely were dispersing transient individuals. Recent observations of lynx have been reported from the Cascades and the Blue Mountains in northeastern Oregon (Csuti *et al.* 1997; R. Anderson, Wallowa-Whitman National Forest, *in litt.* 1998), and preliminary DNA survey results also suggest the presence of lynx in the Cascade Range in Oregon (Weaver and Amato 1999). Lynx have rarely been reported harvested in Oregon, although the season for lynx is essentially open because the State does not regulate lynx harvest, however we do not believe any lynx have been harvested because there are no records of lynx trapping or pelts collected in Oregon (C. Carson, pers. comm., USFWS, Office of Management Authority (OMA), 2000). Based on the limited available information, we cannot substantiate the historic or current presence of a resident lynx population in Oregon.

Idaho—According to Rust (1946), lynx were not abundant but were distributed throughout northern Idaho in the early 1940s, occurring in 8 of the 10 northern and north-central counties. McKelvey *et al.* (1999b) located a number of lynx specimen records from Idaho collected during the early 1900s. Harvest records for Idaho are unreliable because no distinction was made between lynx and bobcats until 1982 when Idaho Department of Fish and Game initiated a mandatory pelt tagging program. Anecdotal reports compiled by Lewis and Wenger (1998) indicated the occurrence of lynx in atypical habitats. Based on the time frames when collected, these records likely were dispersing transient individuals. Between 1960 and 1991, 35 verified records exist for Idaho, with 13 of these from 1982 to 1991 (McKelvey *et al.* 1999b). From 1991 until recently, there had been no verified records of lynx from Idaho (McKelvey *et al.* 1999b); however, until the past year, no lynx surveys were conducted in Idaho. Preliminary results from recent DNA surveys suggest the presence of lynx in northern and north-central Idaho (J. Weaver, Wildlife Conservation Society, *in litt.* 1999).

Prior to 1977, the species was considered a predator, subject to unrestricted harvest with no closed season and no bag limit. In 1990, in response to concern over the status of lynx in Idaho, the Idaho Department of Fish and Game instituted a Statewide harvest quota of three lynx per year. In 1997/1998, Idaho closed the lynx trapping/hunting season because no lynx had been captured in several years.

Although records of lynx in Idaho are relatively common and boreal forest habitat is contiguous with adjacent States and Canada where lynx populations are known to exist, we cannot clearly substantiate either the historic or current presence of resident lynx populations in Idaho, nor can we identify population changes or trend with the available information.

Montana—In Montana, numerous historic and current lynx records exist throughout the Rocky Mountain Conifer Forest in the western part of the State (McKelvey *et al.* 1999b; P. Graham, Montana Department of Fish, Wildlife, and Parks, *in litt.* 1998). Reproduction has been documented (Brainerd 1985). Many records exist of lynx harvested in eastern Montana's Great Plains Region in the 1960s (Hoffman *et al.* 1969); however, we suspect these were dispersing transient animals associated with cyclic highs in northern lynx populations during the early 1960s.

Since 1950, Montana lynx harvest records exhibit cycles (McKelvey *et al.* 1999b), although accurate harvest records were not kept until 1977 when lynx were classified as a furbearer. The harvest data reflect the extreme highs of the early 1960s and 1970s that were documented throughout Canada. Since 1977, Montana's largest lynx harvest occurred in both 1979 and 1984 when 62 lynx were taken in each season (McKelvey *et al.* 1999b; B. Giddings, Montana Department of Fish, Wildlife, and Parks, *in litt.* 1994). These harvest returns were substantially lower than those recorded in the early 1960s and 1970s, leading to concern that lynx populations in Montana were at or near their lowest levels in the past several decades (Hash 1990; S. Conn, Montana Trappers Association, *in litt.* 1990). The State established quotas that were incrementally decreased from 135 in 1982 down to a Statewide quota of 2 beginning in 1991 (B. Giddings, *in litt.* 1994). In 1999, Montana's lynx harvest season was closed.

Harvest records, winter track surveys conducted since 1990/1991, and trapper logbooks, led Montana Department of Fish, Wildlife, and Parks to conclude that the State's lynx population has recovered and is distributed throughout what it determined to be "predicted lynx habitat" (P. Graham, *in litt.* 1998). Montana Department of Fish, Wildlife, and Parks estimated the lynx population as 1,040 lynx in 1994 (B. Giddings, *in litt.* 1994). This estimate was determined using a habitat area/density index, which is likely inaccurate, given broad assumptions regarding habitat suitability and lynx distribution.

We conclude that a resident population of lynx is distributed throughout its historic range in Montana. However, available data are not sufficient to determine either population trend (increasing or decreasing) or estimates of population size. Furthermore, we now question the interpretations we made in the proposed rule as well as those made by the other sources that harvest returns in the 1980s and 1990s reflected substantially reduced populations (see "Factor B" in the "Summary of Factors" section). We now know that harvest returns in the early 1960s and 1970s represented unprecedented cyclic highs for the 20th century (McKelvey *et al.* 1999b). Therefore, it is possible that lower lynx harvest returns in the 1980s were not unusual compared to harvest returns prior to 1960. Lynx harvest returns for British Columbia and Alberta since 1919 demonstrate the variability of cyclic amplitudes throughout the past century (McKelvey *et al.* 1999b) and lead us to suspect that cycles in Montana were similar.

Wyoming—Most historical and recent records of lynx in Wyoming are from the northwestern mountain ranges (Reeve *et al.* 1986; McKelvey *et al.* 1999b). McKelvey *et al.* (1999b) found only 30 verified records Statewide since 1856. Documented reports of lynx in Yellowstone National Park are rare (S. Consolo-Murphy, Yellowstone National Park, pers. comm. 1994); no recent verified records exist from the Greater Yellowstone Ecosystem (McKelvey *et al.*

1999b). However, no lynx surveys have been conducted in this area. Elsewhere, lynx have been reported from the Big Horn Mountains in north-central Wyoming (Reeve *et al.* 1986; McKelvey *et al.* 1999b). Until 1957, lynx had bounties place on them in the State. Since 1973, the lynx has been listed as a protected non-game species and harvest was closed. Because of connectivity with lynx populations and habitat in Montana, we suspect that lynx were historically resident in northwestern Wyoming.

In 1996 the Wyoming Game and Fish Department began a lynx study in west-central Wyoming. Production of kittens was documented in 1998 (Squires and Laurion 1999). This may indicate the presence of a resident population in this local area (Ruggiero *et al.* 1999b). However, using available information we are unable to determine status or trend of lynx throughout Wyoming.

Utah—There are few historic reports of lynx in Utah (McKay 1991; McKelvey *et al.* 1999b). Nearly all the reliable lynx reports are from the Uinta Mountain Range along the Wyoming border (McKay 1991). McKelvey *et al.* (1999b) found only 10 verified records of lynx in Utah since 1916; no verified records exist since 1991. However, recent unverified reports of lynx in the Uintas persist (Bates, Utah Department of Wildlife, pers. comm. 1999). The lynx is listed as a State sensitive species with closed harvest seasons. Based on the limited available information we cannot substantiate either the historic or current presence of a resident lynx population in Utah.

In summary, we believe the Northern Rockies/Cascades Region supports the most viable resident lynx populations in the contiguous U.S., while recognizing that, at best, lynx in the contiguous U.S. are naturally rare. Strong evidence exists to support the presence of resident lynx populations distributed throughout much of the forest types considered lynx habitat in Montana and Washington. We expect that resident lynx populations exist in contiguous habitats in Idaho and northwestern Wyoming. We believe that lynx have always occurred intermittently in Oregon and Utah, although we cannot determine the historic or current presence of resident populations in either of these States. Recently initiated DNA surveys in all the States within this region should further refine our understanding of the status of lynx in this region.

Southern Rockies

Colorado represents the extreme southern edge of the range of the lynx. The southern boreal forest of Colorado and southeastern Wyoming is isolated from boreal forest in Utah and northwestern Wyoming by the Green River Valley and the Wyoming basin (Findley and Anderson 1956 in McKelvey *et al.* 1999b). These habitats likely act as a barrier that reduces or precludes opportunities for immigration and emigration from the Northern Rocky Mountains/Cascades Region and Canada, effectively isolating lynx in the southern Rocky Mountains in Colorado and southeastern Wyoming (Halfpenny *et al.* 1982; Koehler and Aubry 1994). A majority of the lynx occurrence records in Colorado and southeastern Wyoming, are associated with the "Rocky Mountain Conifer Forest" type. The occurrences in the Southern Rockies were generally at higher elevations (1,250 to over 3,750 meters (4,100–12,300 feet)) than were all other occurrences in the West (McKelvey *et al.* 1999b).

Colorado—The montane and subalpine forest ecosystems in Colorado are naturally highly fragmented (Thompson 1994), which we believe limits the size of lynx populations. A total of 78 lynx reports rated as positive (22) or probable (56) exist in State records since the late 1800s (J. Mumma, Colorado Division of Wildlife, *in litt.* 1998); although McKelvey *et al.* (1999b) considered only 17 of these records "verified." The last verified lynx specimens were taken in 1974 (Halfpenny *et al.* 1982). No verified records of lynx exist since 1974; however, extensive survey efforts have resulted in reports of lynx tracks (Halfpenny and Miller 1981; Thompson and Halfpenny 1989; Anderson 1990; Thompson and Halfpenny 1991; Andrews 1992; Carney 1993; Fitzgerald 1994; Colorado Division of Wildlife *et al.* 1997). The lynx has been listed as a State endangered species since 1976 (Colorado Division of Wildlife *et al.* 1997) and harvest of the species is currently closed.

Few, if any, native lynx continue to exist in Colorado (J. Mumma, *in litt.* 1998). As a result, in 1997, the Colorado Division of Wildlife, in cooperation with numerous government and private entities, began a program to introduce lynx from Canada and Alaska into Colorado in an attempt to reestablish a viable lynx population. Forty-one lynx were released into the wild beginning in early spring 1999. It is too early to predict the success of this effort.

Wyoming—"Rocky Mountain Conifer Forest" in southeastern Wyoming is contiguous with that of Colorado. None of the reports of lynx in the Medicine Bow and Laramie Ranges in southeastern Wyoming have been confirmed (Reeve *et al.* 1986). However, McKelvey *et al.* (1999b) found two specimens collected prior to 1900 in southeastern Wyoming. There is a general lack of information in Wyoming, particularly southeastern Wyoming, that limits our ability to assess historical and current status of the lynx.

In summary, we believe that a resident lynx population historically occurred in the Southern Rockies Region in both Colorado and southeastern Wyoming, based on the records of lynx in Colorado and the persistence of contiguous habitat in southeastern Wyoming with the Colorado habitat. This resident population may now be extirpated.

Other Reports or Sightings—Lynx observations in Nevada, North Dakota, South Dakota, Iowa, Nebraska, Indiana, Ohio, and Virginia are considered individuals dispersing subsequent to periods of cyclic high lynx numbers in Canada (Hall and Kelson 1959; Burt 1954 *in* Brocke 1982; McKelvey *et al.* 1999b; S. Johnson, Indiana Department of Natural Resources, *in litt.* 1994; P. Jones, Ohio Department of Natural Resources, *in litt.* 1994; W. Jobman, U.S. Fish and Wildlife Service, *in litt.* 1997; Smithsonian Institute, *in litt.* 1998). During the early 1960s, lynx moved into the Great Plains and the Midwest Region of the U.S. associated with an unprecedented cyclic high in Canada (Gunderson 1978; Mech 1980; DeStefano 1987; South Dakota Natural Heritage Program, *in litt.* 1994). These records are outside of the southern boreal forests where most lynx occurrences are found (McKelvey *et al.* 1999b). We conclude that these unsuitable habitats are unable to sustain lynx and that these records represent dispersing individuals that are lost from the metapopulation unless they return to boreal forest. We do not consider these States to be within the contiguous U.S. range of lynx.

Distinct Population Segment

For a species to be listable under the Endangered Species Act (Act), it must be a "species" as defined in the Act. The Act defines "species" as a species, subspecies, or Distinct Population Segment (DPS) of a vertebrate species. On February 7, 1996, the Service and the National Marine Fisheries Service published final policy guidance concerning recognition of Distinct Vertebrate Population Segments for consideration under the Act (61 FR 4722). We follow the Vertebrate Population Policy when considering listing a vertebrate species as endangered or threatened in only a

portion of its range. In developing the proposed rule and final rule for the lynx, we used the Vertebrate Population Policy to evaluate whether the lynx population in the contiguous United States constitutes a DPS under the Act.

Under the Vertebrate Population Policy, two elements, discreteness and significance, must be considered to determine whether a species' population meets the definition of a DPS. If a population is discrete and significant, its status is evaluated using the five listing factors described in section 4(a)(1) of the Act to determine if it meets the definition of either threatened or endangered.

According to the Vertebrate Population Policy, a species' population can be considered discrete from the remainder of the taxon if it satisfies either one of the following conditions—(1) "it is markedly separated from other populations of the same taxon as a consequence of physical, physiological, ecological, or behavioral factors," or (2) "it is delimited by international governmental boundaries within which differences in control of exploitation, management of habitat, conservation status, or regulatory mechanisms exist."

We have determined that resident populations of lynx existed historically and currently exist within the contiguous United States (see "Status" section). In Canada, management of forest lands and conservation of wildlife habitat varies depending on Provincial regulations. Canada has no overarching forest practices legislation, such as the United States National Forest Management Act, governing management of national lands and/or providing for consideration of wildlife habitat requirements. Additionally, in Canada, lynx harvest regulations, such as length of season and quotas, vary, being regulated by individual Provinces or, in some cases, individual trapping districts. Therefore, we conclude that the contiguous United States population of the lynx is discrete based on the international boundary between Canada and the contiguous United States due to differences in management of lynx and lynx habitat.

According to the Vertebrate Population Policy, a population segment can be considered significant based on considerations that include, but are not limited to, the following—(1) "Persistence of the discrete population segment in an ecological setting unusual or unique for the taxon," (2) "Evidence that loss of the discrete population segment would result in a significant gap in the range of the taxon," (3) "Evidence that the discrete population segment represents the only surviving natural occurrence of a taxon that may be more abundant elsewhere as an introduced population outside its historic range," and (4) "Evidence that the discrete population segment differs markedly from other populations of the species in its genetic characteristics."

Lynx in the contiguous United States may be considered biologically and ecologically significant simply because of the climatic, vegetational, and ecological differences between lynx habitat in the contiguous United States and that in northern latitudes in Canada and Alaska (Buskirk *et al.* 1999b). In the contiguous United States, the distribution of lynx is associated with the mosaic of southern boreal forest and subalpine coniferous forest in the West and southern boreal forest/hardwoods in the East; whereas in Canada and Alaska lynx inhabit the classic boreal forest ecosystem known as the taiga (McCord and Cardoza 1982; Quinn and Parker 1987; Agee 1999; McKelvey *et al.* 1999b) (see "Background" and "Distribution and Status" sections).

Lynx and snowshoe hare population dynamics in portions of the contiguous United States are different from those in northern Canada. We conclude that historic and current lynx and snowshoe hare densities in the contiguous United States are naturally low relative to lynx and hare densities in the northern boreal forest (see "Background" and "Distribution and Status" sections). Because the southern boreal forest in the contiguous United States is naturally highly fragmented and contains more hare predators, it is unable to support the extremely high peak densities of snowshoe hares as in the northern boreal forest of Canada and Alaska (Wolff 1980; Buehler and Keith 1982; Hodges 1999a,1999b; McKelvey 1999a). Therefore, lynx densities at the southern part of the range never achieve the high densities of the northern boreal forest (Aubry 1999).

After review and consideration of lynx status and management in the contiguous United States and Canada, and lynx and snowshoe hare life-history, habitat, and population dynamics, we have determined that the lynx population in the contiguous United States is discrete and significant and, therefore, qualifies as a DPS to be considered for listing under the Act.

Within the contiguous United States population segment, the range of the lynx is divided regionally by ecological barriers of unsuitable lynx habitat. These regions are— (1) the Northeastern Region, including Maine, New Hampshire, Vermont, and New York; (2) the Great Lakes Region, including Michigan, Wisconsin, and Minnesota; (3) the Northern Rocky Mountain/Cascades Region, including Washington, Oregon, Idaho, Montana, northwestern Wyoming, and Utah; and (4) the Southern Rocky Mountains Region, including Colorado and southeastern Wyoming.

McKelvey *et al.* (1999b) illustrate lynx population dynamics emanating from central Canada to the periphery. The authors use Canadian and United States lynx trapping and occurrence data to display lagged synchronous cycles (cycles with similar peaks and lows in population size) (McKelvey *et al.* 1999b), providing evidence of the interconnectedness of lynx population dynamics in the contiguous United States with lynx population dynamics in the Canadian boreal forest. All of the different regions that support lynx within the contiguous United States are directly contiguous with lynx habitat or lynx populations in Canada, except the Southern Rockies, although the connectivity of the Northeast Region is largely limited to areas south of the St. Lawrence Seaway: southern Quebec and New Brunswick.

Within the contiguous United States, all four regions are isolated from each other by expanses of unsuitable habitats that limit or preclude lynx movement between these regions. Unsuitable habitat along the southeastern Great Lakes isolates the Northeastern and Great Lakes regions; the Great Plains isolates the eastern regions from the West. Although there may be some limited potential for dispersal between the Southern and Northern Rockies, lynx in the Southern Rockies are considered to be isolated from lynx populations in the Northern Rockies/Cascades Region by the Green River basin and the Red Desert. We have no expectation that lynx in these individual regions influence the presence or persistence of lynx within another region of the contiguous United States. Therefore, we believe each of these four regions are discrete.

When considering whether a population meets the significance test, policy requires us to evaluate the population as it relates to the entire range of the taxon. In the case of the lynx, the range of the taxon is extensive and exists mainly in Canada and Alaska. When we evaluated the significance of the small discrete regions in the contiguous United States to the entire range of the taxon in North America, we determined that none of these regions individually constitute significantly unique or unusual ecological settings; therefore, they could not be separated from the contiguous U.S. DPS as a whole. Within all four regions of the

contiguous United States, the distribution of the lynx is associated with the southern boreal forest.

We have concluded that none of the four regions, individually, fulfill both the discreteness and significance criteria as provided under the policy. Therefore, we conclude that the listable entity is the contiguous United States DPS of the lynx, consisting of the Northeast, the Great Lakes, the Northern Rockies/ Cascades, and the Southern Rockies regions.

Within the contiguous United States, the relative importance of each region to the persistence of the DPS varies. The Northern Rockies/Cascades Region supports the largest amount of lynx habitat and has the strongest evidence of persistent occurrence of resident lynx populations, both historically and currently. In the Northeast (where resident lynx populations continue to persist) and Southern Rockies regions, the amount of lynx habitat is naturally limited and does not contribute substantially to the persistence of the contiguous United States DPS. Much of the habitat in the Great Lakes Region is naturally marginal and may not support prey densities sufficient to sustain lynx populations. As such, the Great Lakes Region does not currently contribute substantially to the persistence of the contiguous United States DPS. Collectively, the Northeast, Great Lakes, and Southern Rockies do not constitute a significant portion of the range of the DPS. We conclude the Northern Rockies/Cascades Region is the primary region necessary to support the continued long-term existence of the contiguous United States DPS. However, the role that each region plays in the long-term conservation of the species will be explored further in recovery planning for the species.

Previous Federal Action

The lynx was added to Appendix II of the Convention on International Trade in Endangered Species (CITES) of Wild Flora and Fauna in 1977. The species was classified as a category 2 candidate species in the December 30, 1982, Vertebrate Notice of Review (47 FR 58454), meaning that more information was necessary to determine whether the species' status was declining. In response to a petition received on August 22, 1991, we published a notice of a 90-day petition finding on October 6, 1992, that we did not have substantial information to indicate that listing the North Cascades population of the lynx as endangered may be warranted (57 FR 46007). A lawsuit was filed challenging the October 6, 1992, finding. On July 9, 1993, we published a notice indicating that we had reviewed the North Cascades 90-day petition after receiving new information and again found that we did not have substantial information to indicate that listing the population may be warranted (58 FR 36924). In a settlement agreement dated November 30, 1993, we agreed to conduct a status review throughout the lower 48 States to determine if the species was threatened or endangered, and to complete the review and publish the finding by November 15, 1994. On February 2, 1994, we published a notice announcing continuation of the status review (59 FR 4887).

On April 27, 1994, we received a petition to list the conterminous U.S. population of "North American" lynx as threatened or endangered. Additionally, the petitioners requested that the Southern Rocky Mountain population of the "North American" lynx in Wyoming and Colorado be emergency-listed. We published a notice on August 26, 1994, that the petition presented substantial information that listing may be warranted, but that we determined emergency listing was not warranted for the Southern Rocky Mountain population (59 FR 44123).

On December 27, 1994, we published a notice (59 FR 66507) of our 12-month finding that listing the lynx in the contiguous United States was not warranted because of the lack of residency in lynx populations in the lower 48 States and our inability to substantiate that threats such as "trapping, hunting, poaching, and present habitat destruction" actually "threaten the continued existence of the lynx in the wild." On January 30, 1996, the Defenders of Wildlife and 14 other plaintiffs filed a lawsuit challenging our finding.

On March 27, 1997, the court issued an opinion and order setting aside the not warranted finding and remanding it back to us for further consideration. We were ordered to publish a 12-month finding on the status of the lynx within 60 days. On May 27, 1997, we published a 12-month finding (62 FR 28653) that the lynx population in the contiguous United States was warranted for listing under the Act but precluded by higher priority listing actions. This warranted-but-precluded finding automatically elevated the lynx to candidate species status.

On September 15, 1997, Defenders of Wildlife *et al.* filed suit in response to our finding that listing the Canada lynx population in the contiguous United States was warranted but precluded. On February 12, 1998, a settlement agreement was reached that called for us to finalize a proposed rule to list the Lynx in the contiguous United States by June 30, 1998. The proposed rule to list the contiguous United States DPS of the Canada lynx as threatened was published on July 8, 1998 (63 FR 36994).

On July 8, 1999 (64 FR 36836), we extended the listing deadline by 6 months to receive and evaluate comments on new information contained in a report, "The scientific basis for lynx conservation in the contiguous United States" (Science Report), prepared by a team led by the Forest Service's Rocky Mountain Research Station (Ruggiero *et al.* 1999c). As a result, the new listing deadline became January 8, 2000. The Act permits such an extension for the purpose of soliciting additional data when there is substantial disagreement regarding the sufficiency or accuracy of the available data relative to the determination.

The Act requires listing determinations to be made using the best scientific and commercial data available. However, the 1998 settlement agreement allowed only 4 months within which to prepare the proposed rule to list the lynx, much less time than the 9 months allowed by the Act to conduct a status review to make a listing determination. Consequently, we were not able to gather nor consider the best scientific and commercial data available at the time of publication of the proposed rule; instead we relied primarily on data we had gathered during the lynx status review in 1994. Therefore, this final rule treats information available since 1994 as new information; whereas, typically, new information is that information made available subsequent to the proposed rule.

Summary of Comments and Recommendations

In the July 8, 1998, proposed rule and associated notifications (63 FR 58910), all interested parties were requested to submit comments or suggestions on the proposed rule, particularly on the following topics—(1) Biological, commercial trade, or other relevant data concerning any threat (or lack thereof) to this species; (2) Additional information concerning the range, distribution, and population size of the species; (3) Current or planned activities in the subject area and their possible impacts on the species; and (4) Additional information pertaining to the promulgation of a special rule to provide States and Tribes the opportunity to maintain the lead role in protection, management, and recovery of the species through the voluntary

development and implementation of a conservation plan. In the proposed rule, we announced that 10 public hearings on the proposal would be held in various locations throughout the range of the lynx in the contiguous United States. One additional public hearing was announced on August 26, 1998 (63 FR 45445).

Open houses and public hearings, providing an additional forum for public comment on the proposed rule, were held in Colorado, Idaho, Montana, Oregon, Washington, Wyoming, Maine, and Wisconsin. The 60-day comment period on the proposed rule, originally closing on September 30, 1998, was twice extended by request. The first extension was announced on October 2, 1998, and extended the comment period to October 14, 1998 (63 FR 53010). The second extension was announced on October 19, 1998, and extended the comment period on the proposed rule until November 16, 1998 (63 FR 55839).

On July 8, 1999 (64 FR 36836), we extended the listing deadline by 6 months to receive and evaluate comments on new information contained in a report, "The scientific basis for lynx conservation in the contiguous United States" (Science Report), prepared by a team led by the Forest Service's Rocky Mountain Research Station (Ruggiero *et al.* 1999c). The Act permits such an extension for the purpose of soliciting additional data when there is substantial disagreement regarding the sufficiency or accuracy of the available data relative to the determination. On August 18, 1999, we announced that we had reopened the comment period for an additional 38 days to allow the public to provide additional comment on the proposed rule based on new information contained in the Science Report (64 FR 44883).

Prior to making our final listing determination on the lynx, we held the 11 announced public hearings, and allowed for a total of 140 days of public comment on the proposed rule and Science Report. Appropriate Federal and State agencies, tribal governments, county governments, scientific organizations, and other interested parties were contacted and requested to comment during the initial comment period, notified of the extensions, and were again contacted when the comment period was reopened to allow evaluation of the Science Report. Notices of the proposed rule and public hearings were sent to over 1,200 individuals, and public notices were published in 63 newspapers within the contiguous U.S. range of the lynx, including the Spokesman Review, Spokane, Washington; Wenatchee World, Wenatchee, Washington; The Oregonian, Portland, Oregon; The La Grande Observer, La Grande, Oregon; The News Review, Roseburg, Oregon; The Daily Courier, Grants Pass, Oregon; The Bend Bulletin, Bend, Oregon; The Idaho Statesman, Boise, Idaho; Great Falls Tribune, Great Falls, Montana; Independent Record, Helena, Montana; The Missoulian, Missoula, Montana; The Billings Gazette, Billings, Montana; Bozeman Daily Chronicle, Bozeman, Montana; The Daily Inter Lake, Kalispell, Montana; The Western News, Libby, Montana; Casper Star-Tribune, Natrona County, Wyoming; Wyoming Tribune Eagle, Laramie County, Wyoming; The Cody Enterprise, Cody, Wyoming; The Dubois Frontier, Fremont County, Wyoming; Jackson Hole News, Jackson, Wyoming; Pinedale Roundup, Sublette County, Wyoming; The Riverton Ranger, Fremont County, Wyoming; Thermopolis Independent Record, Thermopolis, Wyoming; Detroit Free Press, Detroit, Michigan; Lansing State Journal, Lansing, Michigan; Daily Mining Gazette, Michigan; Marquette Mining Journal, Marquette, Michigan; Iron Mountain News, Iron Mountain, Michigan; Escanaba Press, Escanaba, Michigan; The Evening News, Michigan; North Country Sun, Michigan; Ontonagon Herald, Ontonagon, Michigan; L'Anse Sentinel, L'Anse, Michigan; The Munsing News, Munsing, Michigan; Manistique Pioneer Tribune, Manistique, Michigan; The Newberry News, Newberry, Michigan; Iron River Reporter, Iron River, Michigan; The Menominee County Journal, Michigan; Minneapolis Star Tribune, Minneapolis, Minnesota; St. Paul Pioneer Press, St. Paul, Minnesota; Duluth News Tribune, Duluth, Minnesota; Ely Echo, Ely, Minnesota; Grand Forks Herald, Grand Forks, Minnesota; Bemidji Pioneer, Bemidji, Minnesota; International Falls Journal, International Falls, Minnesota; Virginia Mesabi News, Minnesota; Cook County News, Minnesota; Grand Rapids Herald Review, Minnesota; Milwaukee Journal Sentinel, Milwaukee, Wisconsin; Wisconsin State Journal, Madison, Wisconsin; Wausau Herald, Wausau, Wisconsin; Florence Mining News, Florence, Wisconsin; Spooner Advocate, Spooner, Wisconsin; Rhinelander News, Rhinelander, Wisconsin; Vilas County News Review, Wisconsin; Superior Daily Telegram, Superior, Wisconsin; Bangor Daily News, Bangor, Maine; Manchester Union Leader, Manchester, New Hampshire; Burlington Free Press, Burlington, Vermont; Albany Times Union, Albany, New York; Rocky Mountain News, Denver, Colorado; Boulder Daily Camera, Boulder, Colorado; and The Daily Sentinel, Grand Junction, Colorado.

We received a total of 3,548 responses on the proposed rule, 166 oral and 3,382 written comments. Of these comments, 7 were from Federal agencies; 58 were from State, county, city governments or schools; 3,261 were from individuals; 214 were from organizations and industry; 5 were from tribal governments, and 3 were from Canada. Most of these responses were received in the form of a form letter or postcard. Of these commentors, 2,676 supported listing the Canada lynx, 780 opposed listing, and 92 expressed no position.

In response to the reopening of the comment period on August 18, 1999, to receive comment on the Science Report, we received an additional 379 responses. Of these, 239 supported a listing, 115 opposed the listing, and 25 provided comment on the Science Report only. All written and oral statements presented at the public hearings and received during the public comment periods, including comments on the Science Report and peer review comments, are addressed below and within the text of this rule. Comments of a similar nature are grouped into general issues. These issues and our response to each are discussed below.

Issue 1—Several commentors believed that there are insufficient and/or inadequate data to support evidence of lynx existence and viable population status within the lower 48 States or at the southern fringes of the range. They believed lynx should be managed in Canada rather than by the Act in the United States. Numerous commentors strongly opposed listing the lynx in Oregon and other individual States, claiming there has never been a self-sustaining breeding population of lynx in a particular State. Several commentors were concerned that much of the information used to develop the range maps for lynx in the United States may represent only dispersing individuals and does not indicate viable populations capable of successful reproduction and recruitment. Similarly, several individuals commented that the distribution maps in the Science Report do not accurately reflect occupied range and that there is no evidence that lynx currently exist in many of the States that the map identifies as occupied.

Response—The scientific basis for our findings and conclusions in the proposed rule and those in the Science Report were questioned by many of the affected State wildlife agencies and others that responded during the public

comment period. When making a listing determination, we are required to use the best available scientific and commercial information. To accomplish this, section 4(b)(6)(B) of the Act allows for a 6-month extension of a final determination for the purpose of soliciting additional information if there is substantial disagreement regarding the sufficiency or accuracy of the available data. In the case of the lynx finding, because there was substantial disagreement regarding the sufficiency or accuracy of the available data, we extended for 6 months the deadline for a final listing determination on the proposal to list the contiguous United States DPS (64 FR 36836). The 6-month extension allowed us to receive and evaluate new information contained in the Science Report, a scientific report on lynx prepared by a team of scientist assembled by the Forest Service's Rocky Mountain Research Station in 1998. The Science Report is a comprehensive compilation and assessment of historic and current lynx occurrence records and distribution, scientific literature, lynx and prey ecology, habitat correlations and threats to the continued existence of lynx in the contiguous United States. The Science Report is the only comprehensive assessment of lynx in the contiguous United States and was used, as was the new information obtained during the comment period, in our final listing determination (see "Background," "Distribution and Status," and "Summary of Factors" sections).

Current and best available information, including the Science Report, verified the persistence and presence of lynx in the contiguous United States and recent records of lynx in Oregon (see "Distribution and Status" section). However, with the limited information available on the species, we cannot ascertain whether a resident lynx population exists currently or existed historically in Oregon. We believe that many of the lynx records in the contiguous United States, including Oregon, are of transient animals that dispersed during cyclic population increases (see "Background" and "Distribution and Status" sections). Regardless, the Act, and the Service in administering the Act, do not make a distinction between resident populations, breeding populations, and transient or breeding individuals when considering a species for listing. However animals that are considered "dispersing," and found in unsuitable habitat are considered lost from the metapopulations, because they are unlikely to survive unless they return to boreal forest. Therefore, dispersing individuals were not considered in this listing. Further, the fact that lynx are managed in Canada does not relieve us from our statutory responsibilities to protect the wildlife of the United States. We have determined that the contiguous United States population of lynx is a DPS under the Act and warrants listing as a threatened species. This determination, therefore, includes all lynx within the contiguous United States, whether they be transient lynx or resident populations.

The lynx distribution maps developed for the Science Report were produced by overlaying lynx occurrence records on maps of primary vegetation types (McKelvey *et al.* 1999b). The authors included all occurrence records made available by State, tribal, and Federal agencies, published and unpublished reports, and museum and harvest records. Furthermore, they considered the reliability of the records. Although there may be errors for some individual data points, these data provide a good basis for us to evaluate lynx occurrence and distribution in the contiguous United States. The maps defined vegetation types for which most lynx occurrences are associated. They are not maps of occupied habitat.

Issue 2—Many commentors believed we have insufficient or inadequate data to show that a sufficient prey base historically existed or currently exists in the lower 48 States to support lynx.

Response—The Act requires that the Service make listing determinations solely on the basis of the best scientific and commercial data available. Where there is little information available we use our best scientific judgement and that of experts in the field. Available snowshoe hare information as it applies to lynx is summarized by Hodges (1999a, 1999b) in the Science Report. Additionally, we relied on the availability of the primary habitat types used by both snowshoe hares and lynx as an indicator of suitable habitat and likely presence of one or both species (see "Distribution and Status" and "Factor A").

Issue 3—Many commentors believed there were insufficient or inadequate data to support a listing and that the decision-making process concerning the proposal to list the lynx was being driven by political pressure and lawsuits. One commentor also believed that the limited quantity of evidence gathered by the Service does not meet the standard of sound science required by the Act and that the proposed rule did not acknowledge the strengths and limitations in the extant body of research related to Canada. For example, trapper harvest data do not account for trapper effort which may be affected by pelt prices, social change or climatic conditions. Several commentors wanted to know what the effects of trapping on lynx population status and potential recovery were and if the mortality from accidental trapping or animal damage control activities were significant to the overall population. They similarly commented that the Science Report failed to provide quantified data and conclusions justifying additional protection under the Act and believed that additional studies were needed and should be initiated and completed. They suggested that we defer a decision until more information is available.

Response—While lawsuits have had an important procedural impact in our listing process, whether the species warrants listing under the Act is a substantive biological determination and has remained our responsibility. We have carefully assessed the best scientific and commercial data available, as required by the Act. We recognize that there are limitations in the extant body of data, including the trapping information, and have taken those limitations into consideration when evaluating the data. As described in "Factor B" in the "Summary of Factors" section, harvest returns are affected by factors that influence trapper effort and success, such as changes in socioeconomic conditions, season length, quotas and trapping restrictions, and ease of access. However, we also recognize the harvest data provided information on the presence and persistence of lynx within the contiguous United States (see "Distribution and Status" section). Furthermore, harvest data for lynx in Canada has similarly provided information about the persistence of lynx in adjacent habitats in Canada and increased our understanding of lynx population dynamics (see "Background," "Distribution and Status," and "Factor B" sections). We have determined that the occurrence of lynx within the contiguous United States is influenced to varying degrees by immigration of lynx from Canada.

We carefully assessed the effects of trapping during our review of the species' status (see "Factor B" and "Factor E" in the "Summary of Factors" section). The effects of trapping on lynx populations are variable depending on factors such as whether lynx taken are a part of a resident population or dispersing individuals that are unlikely to reproduce and contribute to a population, fitness of the lynx population in a given area, connectivity within a larger metapopulation, the

impact of other threats to the population, and the additive nature of these threats. If the population is doing well in an area and there are no threats to its continued existence, trapping mortality would not likely jeopardize the population. However, if other threats to a resident population exist, the additive nature of additional losses to the population may prove to be significant, at least on a local scale. Mortality from accidental trapping or animal damage control activities would be considered incidental and in most cases would not be significant; we have no information to indicate that the loss of such individuals has negatively affected the overall ability of the contiguous United States DPS to persist.

We agree that additional studies of lynx are necessary to better understand the dynamics and requirements of lynx populations in the contiguous United States (see "Distribution and Status" section). However, the Act does not allow us to defer a listing decision based on the need for more research. Most scientists would agree that there is always a need for more research, but listing decisions cannot be postponed based on this premise when known threats to a species are present that may result in a species' trend toward extinction.

Issue 4—Several wildlife professionals stated that the effects of overharvesting lynx during the 1970s and 1980s were overstated in our proposed rule and that it does not explain current population levels. If lynx were overharvested in the past, they should have had sufficient time to recover by now. They stated that overutilization is no longer a potential threat nor an additive threat to the continued existence of lynx.

Response—We made our determination to propose the species for listing based on the available information at the time. We concluded that low numbers of lynx in the contiguous United States and Canada were the residual effects of substantial overtrapping that occurred in the 1970s and 1980s. We no longer believe that to be true (see "Factor B" in the "Summary of Factors" section). New information explains that the cyclic lynx highs of the early 1960s and 1970s that are reflected in harvest records were unprecedented high levels for the 20th century. Harvest returns that we believed to be abnormally low, were being compared to harvest records during the unprecedented high levels of the 1960s and 1970s rather than to data for cycles over a longer period of time. Comparisons of the recent records to earlier records from the 20th century indicated comparable harvest records. We conclude that, in the contiguous United States, lynx populations are naturally at low densities; therefore, what seem to be low population levels compared to those of the northern boreal forest in Canada and Alaska likely are normal for lynx at the southern portion of their range where optimal habitat is naturally limited (see "Factor B"of the "Summary of Factors" section).

We recognize the limitations of using harvest data to evaluate the status of a vertebrate population (see "Distribution and Status" section and "Factor B" of the "Summary of Factors" section). There can be numerous reasons for a smaller harvest return one year compared to previous returns, such as trapper effort, weather, or low pelt prices. States in the contiguous United States substantially restricted or closed their lynx harvest seasons by 1990, resulting in less information with which to evaluate the current status of lynx. We now believe that ongoing precautions taken by States and Provinces to restrict lynx trapping since the 1980s possibly prevented the overharvest of resident populations of lynx. We concur with Mowat *et al.* (1999) that it is possible lynx were overharvested in local areas but that in time, particularly with the protection given lynx from trapping closures in the contiguous United States, dispersal by lynx from healthy populations has led and in the absence of significant threats will lead to the repopulation of such areas.

Issue 5—Numerous individuals commented that the proposed rule and the Science Report failed to demonstrate that there are significant threats to the survival of the lynx, claiming that there is little evidence in the proposed rule or the Science Report to support claims that current management practices, including timber harvesting and human access, adversely affect lynx; that lynx are old growth obligates; that either bobcat or coyotes are direct competitors for prey with lynx; that lynx habitat throughout the lower 48 States has been fragmented, degraded or reduced by human activity; or that this has resulted in lynx declines. Additionally, these commentors asked how important were localized threats to the overall status of the species and if we knew enough about the threats to assess the cumulative effects to lynx.

Response—In the proposed rule, we identified numerous potential threats to the continued existence of lynx based on information available at the time. Since then we have significant new information regarding the magnitude and imminence of some of the factors identified as threats in the proposed rule. However, there is still a lack of quantifiability information to determine whether some of the possible threats have or would actually result in lynx declines. Both the "Summary of Factors" and "Background" sections discuss the new information we have obtained and how it has been assessed in our decision, particularly regarding habitat (Factor A) and competition issues (Factor E). Because a substantial amount of lynx habitat in the contiguous United States occurs on federally managed lands, particularly in the West, we conclude that the factor threatening lynx in the contiguous United States is the lack of guidance in existing Federal land management plans for conservation of lynx and lynx habitat. Implementation of lynx conservation through revision of Federal land management plans may sufficiently remove threats to the species such that it no longer warrants listing.

Issue 6—Many State agencies believed the proposed rule failed to demonstrate that there has been significant extirpation of lynx within the lower 48 States or that a significant range reduction has occurred. There is disagreement on the status and historic range of lynx within some States. Furthermore, they believe that lynx do not occur throughout predicted habitat. They requested information on the basis of our determination of whether a resident or remnant lynx population existed within a State and if the low numbers were the result of poor monitoring, marginal habitat or poor rates of immigration from source populations. They believed the Science Report likewise failed to assess lynx population size, status, and trends.

Response—The Act requires us to make listing determinations on the best available scientific and commercial information. Data are often not available to make statistically rigorous inferences about a species' status (*e.g.*, abundance, population trends, and distribution). The extant body of data concerning lynx population status, trends, and historic range is limited. Current information about lynx in the contiguous United States allows us to understand the distribution of lynx. However, the available data for most States do not allow us to assess whether resident populations were historically or are currently present (see "Distribution and Status" section). The scientific community is just beginning to study issues such as specific habitat and prey requirements necessary to support lynx populations, role of dispersing animals in metapopulation dynamics, and lynx

demographics. However, given these uncertainties, we are still charged with determining whether the species warrants listing under the Act. After reviewing the best available information, obtained through a comprehensive effort involving review of historic and current occurrence records, including harvest records for both Canada and the United States; sightings and track records; personal communications with lynx, hare, and forest ecology experts; and a review of all available literature, we have made several conclusions about the status of lynx in the contiguous United States as described in the "Distribution and Status" and "Finding" sections.

In the proposed rule we attempted to identify whether each of the States historically supported or currently support resident populations of lynx. The Act does not make a distinction between protection of resident and migratory or transient species, or between resident populations and those supported by immigration from Canada. Whether a species resides in whole or in part in the United States, it is eligible for protection under the Act. In many instances we cannot be certain whether the lynx was historically resident in a region or was wholly made up of transient animals from Canada or other parts of its range, or a combination of these (see "Background" and "Distribution and Status" sections). However, given the available information from occurrence records, habitat maps, and comparisons of harvest records from the United States and Canada, we concluded that certain areas, such as the Northern Rockies/Cascades Region, continue to support self-sustaining resident lynx populations, while in other areas or regions we were unable to determine the historic or current presence of a resident lynx population based on available information (see "Distribution and Status" section).

Issue 7—Numerous commentors made the following statements: The proposed rule failed to demonstrate that the contiguous United States population represents a DPS and, given the large areas of habitat still directly connected to Canada, evidence of movement across the international border, and the failure to demonstrate that the United States' population is significant, designation of a contiguous United States DPS for lynx is not warranted. The Vertebrate Population Policy does not provide authority for using an international boundary and differences in management programs as a basis for determining discreteness. Likewise, the "significant gap" criterion in the policy was not intended to be applied to populations on the edge of a species' range. There is no evidence that lynx in the United States are capable of long-term survival if isolated from the larger population in Canada. There is no evidence that lynx populations within the contiguous 48 States were once connected. The idea that semi-isolated subpopulations of lynx separate from each other and from Canada can be supported within the United States is contrary to what is known about lynx ecology. Lynx in the United States are part of a trans-border population and should be managed in cooperation with Canada. Conversely, several commentors believe that lynx in the southern portion of Canada have sharply declined and that we cannot rely on immigration from Canada, nor Canadian management of lynx, to maintain lynx in the United States. Several commentors believe that the lynx deserves protection under the Act based solely on its United States' population.

Response—The Service's Vertebrate Population Policy, published in the **Federal Register** on February 7, 1996 (61 FR 4722) specifies that a population segment may be found to be discrete if it satisfies one of two conditions. One of the two conditions states, "It is delimited by international governmental boundaries within which differences in control of exploitation, management of habitat, conservation status, or regulatory mechanisms exist." We have determined that lynx occur in both resident populations and as transients in the contiguous United States and conclude that this population satisfies the above requirement for discreteness based on the international boundary between Canada and the contiguous United States and the differences in management of lynx between Canada and the United States (see "Distinct Population Segment" section). While we recognize that portions of the contiguous United States DPS of lynx are part of a trans-border population, when using the international boundary as a criterion for establishing discreteness, the Vertebrate Population Policy does not make a distinction of whether there is movement between the two populations. While we recognize that this movement occurs, and we believe that immigration from Canada may strongly influence the persistent occurrence of lynx in some portions of the United States' population (see "Distribution and Status" section), this does not negate the international boundary for establishing discreteness between Canadian' and United States' lynx populations under our policy.

Based on the discreteness of a population, our Vertebrate Population Policy requires that we consider the significance of the population to the taxon to which it belongs. We believe there are climatic and vegetational differences in lynx habitat between Canada and the United States, as well as ecological differences between lynx in the contiguous United States and northern populations in Canada and Alaska (see "Distinct Population Segment" section). Therefore, the contiguous United States' population meets the significance criteria for establishment of a DPS.

Additionally, we believe the criterion relating to a "significant gap" in the species' range applies to any discrete unit that exhibits significance regardless of whether it is on the edge of the species' range. For example, there may be situations where populations at the edge of a species range may have unique genetic characteristics or may have adapted to unique or unusual ecological conditions.

Finally, after we established that the United States' population of lynx is discrete and significant, we then applied the listing criteria to the contiguous United States' population of lynx and determined that it meets the definition of a threatened species under the Act (see Factors A-E in the " Summary of Factors" section).

Issue 8—Many commentors believed that lynx in different regions of the United States, isolated in island populations and divided regionally by ecological barriers, even State boundaries, are biologically significant and should be considered for listing separately so that each population can be protected and managed according to its needs. They think that, for a wide-ranging species such as lynx, the status of the lynx population in Montana should have no bearing and should not provide a baseline for populations struggling to survive elsewhere in the lower 48 States. In particular, they stated that the Southern Rockies meets the definition of a DPS and that it should be listed as endangered because it is likely on the verge of extirpation, is genetically isolated, faces continued threats, and meets the definition of an unusual or unique ecological setting. These commentors stated that loss of lynx in the Southern Rockies would result in a significant gap in its range. Furthermore, there is scientific consensus that lynx were once viable in Colorado and southern Wyoming. Conversely, some commentors believe lynx at the southern edge of the range

should be excluded from listing. They stated that existing data suggest that lynx exist in the lower 48 States, especially east of Montana, only as a rare and transitory species at the edge of its range, dependent on continued immigration from Canada.

Response—We recognize that, within the contiguous United States, the distribution of the lynx is divided into four geographically isolated regions; the Northern Rockies/Cascades, Southern Rockies, Great Lakes and Northeast (see "Distribution and Status" and "Distinct Population Segment" sections). In evaluating whether these qualified as separate DPSs or should be considered one, we analyzed whether lynx in these individual regions qualified as both discrete and significant according to our DPS policy. We concluded that within the United States they were geographically isolated and, therefore, qualified as discrete. When considering whether a population meets the significance test, policy requires that our evaluation take into account the population as it relates to the entire range of the taxon. In the case of the lynx, the range of the taxon is extensive and exists mainly in Canada and Alaska. Only a small portion of the range extends into the United States. The Southern Rockies and Northeast regions account for an extremely small fraction of the entire range of the taxon. We determined that none of the regions individually constitute significantly unique or unusual ecological settings. Within all four regions of the contiguous United States the distribution of lynx is associated with the southern boreal forest. The important element for lynx is forest structure that provides food and cover for snowshoe hares and cover for lynx dens, not the specific vegetation found within the boreal forest. Therefore, the individual regions could not be considered individually significant under our Vertebrate Population Policy and could not be separated from the contiguous United States DPS as a whole. We determined that, individually, none of the four regions fulfill both the discreteness and significance criteria as required under the Vertebrate Population Policy (see "Distinct Population Segment" section). Therefore, we conclude that the listable entity is the contiguous United States DPS of the lynx, consisting of the Northeast, the Great Lakes, the Northern Rockies/Cascades, and the Southern Rockies regions.

Within the contiguous United States, the relative importance of each region to the persistence of the DPS varies. The Northern Rockies/Cascades Region supports the largest amount of lynx habitat and has the strongest evidence of persistent occurrence of resident lynx populations, both historically and currently. In the Northeast, Great Lakes, and Southern Rockies regions, the amount of lynx habitat is relatively limited and does not contribute substantially to the persistence of the contiguous United States DPS. We conclude the Northern Rockies/Cascades Region is the primary region necessary to support the continued long-term existence of the contiguous United States DPS.

Issue 9—Several individuals believed that we failed to take into account the increased abundance of mountain lions as a threat to lynx and that the rule should acknowledge this concern and discuss this factor as potentially affecting Canada lynx.

Response—At the time we wrote the proposed rule to list the lynx as a threatened species, we did not address mountain lion competition with lynx because we had no information that it was a potential threat. Subsequently, the Science Report has identified the potential threat of mountain lion competition (Aubry et al. 1999; Buskirk et al. 1999a). Definitive data on the potential threat of mountain lions on lynx are lacking. However, because known incidents of mountain lions killing lynx are rare, we presume they occupy different ecological niches (particularly in winter), and because they depend on different prey, we conclude that the population-level effect of mountain lions on lynx is minimal (see "Factor E" of the "Summary of Factors" section).

Issue 10—Some commentors believed we did not provide for adequate public participation in commenting on the Science Report or in response to the listing proposal.

Response—Prior to making our final listing determination on the lynx, we held 11 public hearings and allowed for a total of 140 days of public comment on the proposed rule and Science Report. Our proposed rule to list the lynx as threatened, published in the **Federal Register** on July 8, 1998, opened a 60-day comment period during which we requested comments and materials concerning the proposed rule. At the same time we announced that 10 public hearings on the proposal would be held in various locations throughout the range of the lynx in the contiguous United States. One additional public hearing was announced on August 26, 1998 (63 FR 45445). Open houses and public hearings, providing a forum for verbal comment on the proposed rule, were held in Colorado, Idaho, Montana, Oregon, Washington, Wyoming, Maine, and Wisconsin. Announcements of the proposed rule and public hearings were made in local newspapers throughout the range of the lynx. The comment period on the proposed rule, originally closing on September 30, 1998, was twice extended by request. From the time a proposed rule is published, the Act allows 12 months in which to make and publish a final determination on a listing action. We extended the 1-year period for the lynx final listing determination for 6 months in a July 8, 1999, **Federal Register** announcement (64 FR 36836), specifically to allow for review, evaluation, and comment on the Science Report because there was substantial disagreement regarding the sufficiency and accuracy of the information. On August 18, 1999, we announced in the **Federal Register** that we were reopening the comment period for an additional 38 days to allow the public to review and comment on the proposed rule based on new information contained in the Science Report, which was placed on the Internet for accessibility. Press releases were issued to ensure the public was aware of the reopened comment period. While we received requests to extend the comment period on the Science Report, we declined to do so because of the time frames the Act allows for completion of a final listing determination, the amount of public notice about the Science Report and rapid availability of the Science Report to interested parties via the Internet.

Issue 11—Several individuals believe the lynx should be listed as endangered, not threatened because they believe the lynx is in danger of extinction throughout a significant portion of its range, that it is part of our cultural heritage and should be protected. They stated that in light of the uncertainties about the existing information collected on lynx status and threats, the Service should be cautious and protect existing populations of lynx while additional information is collected. If listed as endangered the lynx would receive the full protection of the Act. Listing would focus more attention on the precarious status of the species and encourage State wildlife agencies to do more educational outreach and encourage conservation on private lands. These commentors also stated that a listing would increase attention given to lynx by Federal land management agencies and would provide the oversight that is needed to ensure conservation and recovery activities are implemented and are effective. Some commentors also believed that failure to list the lynx as

endangered would be contrary to the settlement agreement and other court-ordered stipulations, as well as the Service's listing priority guidance. They stated that the proposed rule to list the lynx as threatened rather than endangered is inconsistent with the prior "warranted" petition finding of May 27, 1997, in which the Service assigned the lynx its highest listing priority number because of the magnitude and imminence of the threats. Conversely, some commentors believed that a listing as threatened was more appropriate and would provide the opportunity and resources to plan a conservation strategy at the landscape scale.

Response—When evaluating whether a species, or in this case a DPS, should be listed as threatened or endangered, we first assess the current status of the DPS and then analyze the degree, magnitude and imminence, of the threats to its continued existence. If we conclude that a DPS of a species is likely to go extinct in the foreseeable future, then we must list it as endangered. If we conclude that it is likely to become endangered in the foreseeable future then we must list it as threatened. While we made an extensive effort to find and assess all the available information on the status of lynx in the contiguous United States, the best scientific information available does not provide a clear picture as to the current status of the species (see "Distribution and Status" section). The lack of information on lynx does not allow us to determine with certainty whether the species' population trend is stable, increasing or declining. However, we can make several inferences from the available data. Resident populations continue to exist in the Northern Rockies/Cascades and Northeast regions. Available information provides evidence that within the contiguous United States, lynx continue to occur in most places with historical evidence of persistence except for possible range reductions in the Northeast and Southern Rockies. Given available information on current and historical lynx occurrence and threats, as identified in the "Summary of Factors" section, we conclude that the contiguous United States DPS of the lynx is threatened (see "Finding" section).

In the proposed rule, various threats were identified as potentially affecting lynx populations (see "Summary of Factors" section), including competition, habitat loss and fragmentation, and the inadequacy of existing regulatory mechanisms (in the form of land management plans) to protect the species. However, there is inconclusive evidence that any of these factors, with the exception of inadequate regulatory mechanisms, may actually adversely affect the contiguous United States' lynx population. At the local level, particularly in the Southern Rockies, habitat loss and fragmentation may negatively affect lynx (see "Factor A" and "Factor E" of the "Summary of Factors" section). However, at the DPS scale, we conclude the factor threatening lynx is the inadequacy of existing regulatory mechanisms, specifically the lack of guidance for conservation of lynx and lynx habitat in Federal land management plans (see "Factor D" of the "Summary of Factors" section). A substantial number of the primary areas of lynx occurrence are on Federal lands (see "Factor A" of the "Summary of Factors" section) where programs, practices and activities allowed by current plans may cumulatively impact lynx.

In the settlement agreement dated February 12, 1998, we agreed to publish a proposed rule to list the lynx within the contiguous United States under section 4 of the Act. At the time, we had not determined whether it warranted threatened or endangered status. In the "warranted but precluded" petition finding of May 27, 1997, we assigned the lynx a listing priority number of 3. Guidelines for assigning listing priority numbers, published in the **Federal Register** on September 21, 1983 (48 FR 43098), describe a system for considering three factors in assigning a species a numerical listing priority on a scale of 1–12. The three factors are magnitude of threat (high or moderate to low), immediacy of threat (imminent or non-imminent), and taxonomic distinctiveness (monotypic genus, species or subspecies/population). For a population, such as the contiguous United States' Canada lynx population, listing priority numbers of 3, 6, 9, or 12 are possible. At the time of the "warranted but precluded" finding we concluded that the overall magnitude of threats to lynx was high and that the threats were imminent. Therefore, a priority number of 3 was assigned. New information indicates that threats are at a much lower magnitude than previously believed (see "Summary of Factors" section).

Issue 12—Several commentors were concerned that we did not propose a special 4(d) rule for incidental take of lynx along with the proposed listing. They encouraged us to cooperate with the respective States and Tribes in the development of a 4(d) rule and wondered what type of Federal oversight role would follow the issuance of a special rule.

Response—Section 4(d) of the Act provides that whenever a species is listed as threatened, the Secretary of Interior will issue regulations deemed necessary and advisable to provide for the conservation of the species.

We have issued regulations that generally apply to threatened wildlife virtually all the prohibitions that section 9 of the Act establishes with respect to endangered wildlife. These prohibitions, in part, make it illegal for any person subject to the jurisdiction of the United States to "take" any listed wildlife species; to harass, harm pursue, hunt, shoot, wound, kill, trap, or collect any threatened or endangered species or to attempt to engage in any such conduct (16 U.S.C. section 1532 (19)).

Our regulations for threatened wildlife also provide that a "special rule" under section 4(d) of the Act can be tailored to define the section 9 prohibitions for particular threatened species. In that case, the general regulations applying most section 9 prohibitions to threatened species do not apply to that species, and the special rule is to contain the prohibitions (and exemptions) necessary and appropriate to conserve that species.

Such regulations generally are issued and published as special rules in the **Federal Register** along with or following a listing. This final rule includes a special 4(d) rule that addresses the taking and export of captive lynx. To address incidental take of lynx while engaged in otherwise lawful hunting and trapping for bobcat we are currently consulting under section 7 of the Act with the U.S. Fish and Wildlife Service's Office of Management Authority which issues CITES permits for export of bobcat pelts. Additionally, we have worked with State and Tribal agencies and are currently preparing an additional special 4(d) rule to address incidental take of lynx resulting from otherwise lawful hunting and trapping for species other than bobcat (and other than lynx). This proposed amendment to the special rule will describe the Federal oversight that will be required if the rule is implemented. We hope to publish the proposed special rule in the **Federal Register** as soon as possible following this listing rule.

Issue 13—One commentor asked what role the Draft Lynx Conservation Assessment and Strategy (LCAS) would play in the long-term conservation of lynx if the species were listed. Another commentor was concerned about conferencing with other Federal agencies to conserve lynx and how we

intended to work with other agencies to identify and implement protective lynx measures. They suggested that a comprehensive review of the Forest Service Forest Management Plans is needed to assess their impacts upon potential lynx habitat and that management plans should be revised to improve snowshoe hare and lynx habitat. Many commentors also stated that Federal agencies should manage and protect public lands in a manner that will increase snowshoe hare habitat.

Response—The LCAS was developed to provide a consistent and effective approach to conservation of lynx on Federal lands in the contiguous United States (United States Forest Service *et al.* 1999). It was developed by the Forest Service, Bureau of Land Management (BLM), National Park Service, and the Service. The overall goals of the LCAS were to develop recommended lynx conservation measures, provide a basis for reviewing the adequacy of the Forest Service and BLM Land and Resource Management Plans with regard to lynx conservation, to facilitate section 7 conferencing and consultation under the Act should the lynx be listed (see "Factor D" of the "Summary of Factors" section) and to guide future recovery efforts. The "Draft Biological Assessment of the Effects of National Forest Land and Resource Plans and Bureau of Land Management Land Use Plans on Canada Lynx" (DBA) identified potential effects resulting from 57 Forest Service Land and Resource Management Plans and 56 BLM Land Use Plans within the 16-State area where lynx were proposed for listing (United States Forest Service and Bureau of Land Management 1999).

Section 7(a)(4) of the Act states that Federal agencies shall confer with the Service on any agency action which is likely to jeopardize the continued existence of any species proposed to be listed under section 4 of the Act or result in the destruction or adverse modification of critical habitat proposed to be designated for such species. Conferencing is a process of early interagency cooperation involving informal or formal discussions between a Federal agency and the Service regarding the likely impact of an action on proposed species or critical habitat. It is designed to help Federal agencies identify and resolve potential conflicts between an action and species conservation early in a project's planning and to develop recommendations to minimize or avoid adverse effects to proposed species or proposed critical habitat. With this final rule to list the lynx within the contiguous United States as threatened, conferencing is no longer applicable and any agency actions that may affect the lynx will need to be addressed under consultation in accordance with section 7(a)(2) of the Act.

For the lynx, the Forest Service, BLM, National Park Service, and the Service recognized that Federal agencies have a significant role in the conservation of lynx. They established a Lynx Steering Committee in 1998 consisting of representatives from each agency. The Steering Committee provides oversight and guidance to teams established to address various lynx conservation issues on Federal lands. One team developed the LCAS; another team developed the Science Report; a third team prepared a biological assessment to evaluate the effects of Forest Service and BLM Land Management Plans on lynx. All of these efforts are intended to plan and implement sound conservation actions and management decisions for lynx on Federal lands.

Issue 14—Numerous commentors were concerned about the economic, social, and cultural effects of listing the lynx. They believed a listing would result in increased burdens on local economies affecting jobs, culture and way of life, and that the cost of implementing a lynx conservation and recovery program is not an efficient allocation of tax dollars.

Response—When drafting the Act, Congress found in section 2(a)(1) that, "various species of fish, wildlife and plants in the United States have been rendered extinct as a consequence of economic growth and development untempered by adequate concern and conservation." In keeping with this finding, listing decisions, other than critical habitat designations, are not subject to economic analyses. The purpose of listing a species is to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved, to provide a program for the conservation of such endangered species and threatened species, and to take such steps as may be appropriate to conserve the various species facing extinction. In accordance with 16 U.S.C. 1533(b)(1)(A) and 50 CFR 424.11(b), listing decisions are made solely on the basis of the best scientific and commercial data available. In adding the word "solely" to the statutory criteria for listing a species, Congress specifically addressed this issue in the 1982 amendments to the Act. The legislative history of the 1982 amendments states— "The addition of the word 'solely' is intended to remove from the process of the listing or delisting of species any factor not related to the biological status of the species. The committee strongly believes that economic considerations have no relevance to determinations regarding the status of species * * *," H.R. Rep. No. 567, Part I, 97th Cong., 2d Sess. 20 (1982). Therefore, we have not considered the impacts of listing on economic development in making this listing determination. However, economic impacts will be considered in the designation of critical habitat.

Issue 15—We received numerous comments concerning the impact of a listing on the status of introduced lynx in Colorado and requests that these animals be declared a 10(j) "nonessential experimental population."

Response—The term "experimental population" as defined in the Act, refers to any population (including any offspring arising solely therefrom) of an endangered species or a threatened species released outside the current range of the species to further its conservation. Experimental populations can only be established when they are wholly separate geographically from nonexperimental populations of the same species. Since there is no clear evidence of the absence of a lynx population within the area prior to reintroduction, establishment of an "experimental population" would not be possible and was not pursued in Colorado. The lynx that were recently introduced into Colorado from Canada and Alaska were released prior to this rule and the resulting placement of the species on the list of threatened and endangered species. Therefore, as of this final rule, they are considered resident lynx and do not qualify as an experimental population. Further, these reintroduced lynx are included as part of the listed entity and placed on the list of threatened and endangered species as of the effective date of this final rule.

Issue 16—Several commentors believed that there is a very limited potential, or none at all, for re-establishment, recolonization, and population expansion of historic lynx habitat because of habitat changes, human-induced mortality, and bobcat and mountain lion competition with lynx. They believed the lynx decline is the result of global warming, a natural factor which has allowed the prey generalists, and bobcat and mountain lion, to move into lynx territory and outcompete this less adaptable specialist.

Response—We recognize that some historic lynx habitat may no longer be suitable for recolonization of lynx because of habitat changes. However,

we do not agree that global warming or the expansion of the bobcat range has resulted in eliminating historic habitat from recolonization by lynx. There is no evidence that either the bobcat or mountain lion outcompete the lynx for habitat and food resources (see "Factor E" of the "Summary of Factors" section). The lynx, bobcat, and mountain lion co-evolved in similar, yet spatially segregated environments. The lynx is specially adapted for deep snow habitats while the bobcat and mountain lion are not. This special adaptation allows the lynx to outcompete bobcat and mountain lion in deep snow environments. Because we have limited understanding of lynx habitat requirements, it is difficult to determine precisely the amount of habitat available historically or currently. In the majority of the range of lynx in the contiguous United States, suitable habitat remains available (see "Factor A" of the "Summary of Factors" section). There is no evidence to support global warming as a threat to the lynx.

Issue 17—Several commentors stated that in lieu of listing, we should pursue candidate conservation mechanisms that eliminate the need to list. Efforts should be focused on landscape planning, developing conservation agreements, forest management plans and lynx conservation criteria in lieu of listing. A multi-species forest planning process, incorporating not only species but special habitats and unique biological communities, would be a better approach, providing more protection to lynx and other wildlife communities, than a single species listing under the Act. They believed that managing for only one species might be detrimental to other species or communities.

Some commentors stated that we failed to take into account the continuing forest fragmentation and increased competition brought on by road construction, excessive timber harvest, off-road back country use and ski area development. They stated that we should implement strong standards to prevent excessive logging, road development, and other human developments in important lynx habitat. Lynx conservation can only be achieved at the landscape scale. They further believed that we failed to take into account the adequacy, inadequacy, political pressures, and limitations of current State and Forest Service programs and questioned the role of these existing programs for lynx as regulatory mechanisms.

Response—We fully support candidate conservation mechanisms, landscape planning, and changes in forest planning as mechanisms to conserve candidate species and species at risk. We are signatories to numerous candidate conservation agreements across the country. The Act requires us to consider conservation efforts by the States and others in listing decisions. However, to conclude that a conservation effort removes the need to list a species, we must determine that the conservation effort is sufficiently certain to be implemented and effective.

In the case of amending forest management plans, we have specifically identified current Federal regulatory mechanisms as a threat to lynx because of the ongoing and potential future actions allowed by current Land and Resource Management Plans. Changes in land management plans to manage these potential threats would result in a significant reduction to the current threats facing the species and, therefore, would strongly factor in future lynx status determinations. In the case of State regulatory and conservation mechanisms, we also have identified that existing State programs will be essential in lynx conservation and recovery (see "Issue 19").

Issue 18—Numerous State agencies believe that Federal intervention is not necessary to manage and protect the lynx and that State regulatory protection is adequate. Some States hold that they are already doing everything they can to protect and conserve the lynx. They further believe that States are in a better position to manage the lynx in the future, as they maintain the bulk of the information and management expertise and that we should, as an interim step, assist the respective States and other Federal agencies in gathering biological information and implementing management plans through funding or joint ventures. They questioned how the Act provides for a species' recovery.

Response—The role of the Service, as mandated by the Act, is more encompassing than is the role of individual States, or even groups of States. States are responsible for the management of species within their boundaries and to their credit, most if not all States have implemented lynx management measures. The Service, pursuant to the Act, must evaluate the status of a species throughout its entire range and, when determined necessary, provide for its conservation and recovery. In the case of the lynx, this includes 14 separate States. While some States may still harbor resident populations of lynx, the status of lynx in other States is unclear. The Service, as a Federal agency, is responsible for coordinating recovery of a species such as the lynx that crosses State boundaries and occupies substantial amounts of habitat on Federal lands. Furthermore, we have identified the major threat to lynx as the inadequacy of Federal regulatory mechanisms to provide for the long-term conservation of the species. Listing the lynx under the Act confers substantive protections not otherwise provided by State management.

We agree that the States maintain management expertise and knowledge of lynx within their boundaries, particularly concerning evidence of resident populations or individuals and local snowshoe hare abundance. Much of the available information on lynx status and threats comes from the reports of State wildlife agencies. States have already taken significant steps within their jurisdiction to conserve lynx. With the exception of Oregon, all States within lynx range have closed lynx trapping seasons. In some cases they have been closed for more than 2 decades. New York and Colorado have attempted lynx reintroduction as a means to re-establish viable populations. Long-term conservation of the lynx will not only be dependent on the States continuing their respective conservation programs, but on Federal agencies improving their efforts to conserve lynx and, where necessary, amending regulations, policies and/or practices for the conservation of the species.

When a species is listed under the Act, additional protections and prohibitions are applied. These efforts further conservation in several ways. When a species is listed under the Act as either threatened or endangered, it becomes illegal to "take" the species without a permit or incidental take statement from the Service. The term "take" means to harass, harm, hunt, should, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. "Harm" is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns, such as breeding, feeding, or sheltering. "Harass" is defined as actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns, which include but are not limited to breeding, feeding, or sheltering. Federal agencies are required to conserve species listed under the Act and to consult with the Service on any actions that may affect the species. Furthermore, the Act requires that the Service develop and implement a species recovery plan unless such a plan will not promote the recovery of the

species. When a species is considered recovered, it can then be removed from the list of threatened and endangered species.

Issue 19—One commentor stated that if the lynx were listed, restrictions imposed, such as limitations on trapping, would interfere with Tribal treaty rights.

Response—We have been communicating with Tribal governments regarding development of a special 4(d) rule (see "Issue 12") that would address the incidental take of lynx resulting from otherwise legal trapping and hunting for species other than lynx on Tribal lands. Under Executive Order 13084 "Consultation and Coordination with Indian Tribal Governments" (63 FR 27655, May 14, 1998) we are to inform and receive input from Tribal governments of any actions, such as listings under the Act, that may affect Tribes and to work to resolve any conflicts. However, there are certain circumstances where we cannot resolve issues to everyone's satisfaction. The Act applies to Tribal, as well as all other lands within the United States, and, therefore, the prohibitions brought on by the listing of a species, also apply. There are numerous Tribes within the range of the lynx that might be affected by this listing. On some Tribal lands lynx harvest seasons have already been closed. We will continue to work with Tribal governments to avoid or minimize conflicts should they arise.

Issue 20—In response to our reopening of the comment period for review of the Science Report we received numerous specific comments on the adequacy, accuracy and reliability of the Science Report. One commentor believed we should convene a Blue Ribbon panel to review the Science Report and make those deliberations part of the record. The information should be shared with the States and collaborative workshops conducted to ensure that all information is thoroughly evaluated and judged fairly against standards that are supportable.

Response—We employed a seldom-used section of the Act, section 4(b)(6)(B), in extending the time frame for issuance of a final listing rule by 6 months. We reopened the comment period on the lynx proposed rule specifically to allow for review, evaluation, and comment on the Science Report because there was substantial disagreement regarding the sufficiency and accuracy of the data relative to the listing determination in the proposed rule. We solicited comments on the Science Report from hundreds of agencies, Tribal governments, organizations, scientific experts, and individuals. All comments received have been incorporated into the administrative record for this rule and have been reviewed and incorporated into our decision making process.

While we recognize that there are limitations to the Science Report and have attempted to explain these throughout this rule, we also believe that it provides a comprehensive review of the current knowledge concerning the lynx in the contiguous United States. Therefore, we could not ignore it during our review. We have conducted an exhaustive review of the Science Report and all available literature and data on lynx in the United States, as well as the extensive comments we received on the proposed listing. Because of the wide range of the species, sizable list of interested parties and time limitations, it was not possible to convene a workshop of all interested parties specifically to discuss the Science Report. However, we have been in contact with specialists knowledgeable about lynx, hares, forest ecology and management, and potential lynx competitors to discuss various issues about the Science Report. This also is part of the administrative record for this finding.

Issue 21—Numerous responses addressed and opposed a proposed reintroduction of lynx into Idaho.

Response—We received extensive comment on this particular issue and are addressing it here for clarification purposes. We have not proposed a reintroduction effort for Idaho. At this time, we have not proposed any reintroduction efforts for lynx. Past reintroduction, both in New York and in Colorado, have been initiated and conducted by State wildlife agencies because they believed the lynx had been extirpated or extremely reduced in numbers in specific, historically occupied habitat. In recent years, Idaho Department of Fish and Game considered reintroducing lynx into the State. If during the course of recovery planning for lynx, reintroduction are proposed, we would conduct extensive public outreach, with public hearings and comment periods, to determine the feasibility of such a project.

Peer Review

On July 1, 1994, we published a notice in the **Federal Register** announcing our interagency policy to clarify the role of peer review in activities we undertake under authority of the Act (59 FR 34270). This Interagency Cooperative Policy on Peer Review states that it is the policy of the Service to incorporate independent peer review in listing decisions during the public comment period in the following manner—(1) Solicit the expert opinions of a minimum of three appropriate and independent specialists regarding pertinent scientific and commercial data and assumptions relating to the taxonomy, population models, and supportive biological and ecological information for species under consideration for listing; and (2) Summarize in the final decision document the opinions of all independent peer reviewers received on the species under consideration.

In accordance with this policy, in a letter dated August 21, 1998, we solicited the expert, independent professional opinion of six peer reviewers. We specifically asked the reviewers to address the following questions—(1) Does the information referenced and described in the "Distribution and Status" section of the proposed rule support the Service's conclusions regarding the status of the lynx in the contiguous United States; and (2) Does the information referenced and described in the "Summary of Factors Affecting the Species" section of the proposed rule support the Service's conclusions about threats to the lynx in the contiguous United States? We also requested the reviewers advise us of other available information that would assist us in making a final listing decision.

In response to our solicitation, we received two comment letters. Both commentors stated that they believed the status and threats to the lynx were reliably documented in the proposed rule. The commentors provided some additional information concerning an ongoing survey for lynx populations and the status of lynx in Idaho, Washington, and Wyoming, and also commented that our conclusion that resident populations of lynx historically occurred in Massachusetts, Pennsylvania, and Utah, and possibly Vermont and New Hampshire, was problematic. This information has been incorporated into our discussion of the status of the species. The same response also indicated that the forest practice of precommercial thinning was a greater threat than we had indicated and felt that conservation of lynx across southern Canada was important to conservation of lynx across the northern United States. These comments also have been incorporated into our analyses.

Summary of Factors Affecting the Species

Section 4 of the Act and regulations (50 CFR part 424) promulgated to

implement the listing provisions of the Act set forth the procedures for adding species to the Federal lists. A species may be determined to be an endangered or threatened species due to one or more of the five factors described in section 4(a)(1). These factors and their application to the Canada lynx (*Lynx canadensis*) are discussed below.

Factor A. The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range

Factors affecting lynx habitat include human alteration of the distribution and abundance, species composition, successional stages, and connectivity of forests, and the resulting changes in the forest's capacity to sustain lynx populations. People change forests through timber harvest, fire suppression and conversion of forest lands to agriculture. Forest fragmentation may eventually become severe enough to isolate habitat into small patches, thereby reducing the viability of wildlife that are dependent on larger areas of forest habitat (Litvaitis and Harrison 1989).

Since the publication of the proposed rule, we received new information related specifically to lynx—habitat associations (McKelvey *et al.* 1999b; United States Forest Service and Bureau of Land Management 1999), the distribution and ownership of lynx forest types as well as the amount of habitat in specific Federal land allocations (United States Forest Service and Bureau of Land Management 1999), the types and effects of different forest management practices (United States Forest Service *et al.* 1999), the effects of fire suppression (Agee 1999), and some probable implications of forest management practices on lynx forest types (McKelvey *et al.* 1999d).

New information suggests that lynx in the contiguous United States occur at naturally low densities. Lynx are limited to moist, cool boreal forests that support some minimum density of snowshoe hares, where winters are snowy (Ruggerio *et al.* 1999b). Snowshoe hares in the contiguous United States occur at low levels compared to northern reaches of their range in Canada and Alaska (Hodges 1999a, 1999b). Two important human influences on snowshoe hare habitat are timber harvest and fire suppression; however, our knowledge of how lynx populations respond to these specific impacts is limited.

In all regions of the lynx range in the contiguous United States, timber harvest and its related activities are a predominant land use affecting lynx habitat. Timber harvest and associated forest management can be benign, beneficial, or detrimental to lynx depending on harvest methods, spatial and temporal specifications, and the inherent vegetation potential of the site.

For example, intensive tree harvesting (large-scale clearcutting) can eliminate the mosaic of habitats and mix of forest stand age classes that promote lynx survival, including late successional seral stages that support lynx denning and red squirrel habitat, and early successional snowshoe hare habitat. The response of lynx populations to particular vegetative mosaics is unknown. However, timber harvest can result in reduced cover, unusable forest openings, and large monotypic stands with sparse understories that are unfavorable for lynx and snowshoe hare, the primary lynx prey (Brittell *et al.* 1989; de Vos and Matel 1952; Harger 1965; Hatler 1988; Koehler 1990; K. Gustafson, pers. comm. 1994; J. Lanier, pers. comm. 1994). Some studies indicate that lynx avoid openings such as clear-cut, unforested areas, and grasslands (Koehler *et al.* 1979; Koehler and Brittell 1990; Murray *et al.* 1994). Snowshoe hares also are unlikely to use such areas because of the lack of cover (Koehler *et al.* 1979; Koehler and Aubry 1994; H. Golden, Alaska Department of Fish and Game, pers. comm. 1994). Mechanical thinning of densely stocked young stands to promote vigorous growth of fewer trees can reduce the stem densities required to support high numbers of snowshoe hare (United States Forest Service *et al.* 1999a). Reductions in cone-bearing mature and older forests can result in decreases in habitat for red squirrel, an important alternate lynx prey (Koehler 1990; O'Donoghue 1997; Apps 1999; Mowat *et al.* 1999).

Forestry practices can be beneficial when the resulting understory stem densities and structure meet the forage and cover needs of snowshoe hare (Keith and Surrendi 1971; Fox 1978; Conroy *et al* 1979; Wolff 1980; Parker *et al.* 1983; Litvaitis *et al.* 1985; Monthey 1986; Bailey *et al.* 1986; Koehler 1990; McKelvey *et al.* 1999d). Hodges (1999a, 1999b) illustrated that snowshoe hare densities are highest in regenerating stands with very high stem densities. Regeneration harvest can be used to create high quality snowshoe hare habitat, especially where natural regeneration would be expected to provide dense young vegetation. Although large openings may initially be underused by snowshoe hare and lynx, regeneration harvest units in appropriate habitat types eventually (in 15 years or more depending on the type of forest) achieve early successional stages in forests preferred by snowshoe hares (Monthey 1986; Quinn and Parker 1987; Koehler 1990; Koehler and Brittell 1990; Washington Department of Wildlife 1993; McKelvey *et al.* 1999c). Lynx can readily move across landscapes fragmented by commercial forestry (Squires and Laurion 1999). Larger openings can often more closely resemble vegetative patterns that follow natural disturbance events, and decrease amounts of edge favorable to generalist predators (McKelvey *et al.* 1999c).

Natural fire has an important role in forest ecology in some forest types in the United States. During the early 20th century, Federal and State agencies in the contiguous United States enacted a policy of suppressing forest fires. The effects of fire suppression, as well as timber harvest, on lynx habitat vary among the geographic regions (Agee 1999) and will be discussed separately below for western and eastern regions.

McKelvey *et al.* (1999b) used lynx occurrence data to describe lynx distribution patterns and habitat associations. The primary vegetation classes encompassing the majority of lynx occurrences in the West were Rocky Mountain Conifer and Pacific Northwest Conifer, including Douglas-fir and western spruce/fir and fir/hemlock. In the Great Lakes, the primary vegetation class was Mixed Deciduous-Coniferous, and in the Northeast, Mixed Forest-Coniferous Forest-Tundra. These broad vegetation classes include areas that because of elevation or other physical factors are not considered lynx habitat and cannot easily be deleted from the data. Therefore, accurate assessments of the total amount of lynx habitat within these regions is not possible. However, we assume that the areas encompassed within these vegetation classes contain the majority of lynx habitat types in the regions. We also assume that pockets of lynx habitat may occur outside these broad vegetation classes. With these assumptions in mind, where our discussion is based on lynx/habitat associations as reported in McKelvey *et al.* (1999b), we shall refer to the landscapes characterized by these broad vegetation classes as lynx forest types.

Northern Rockies/Cascades and Southern Rockies

In the western regions, most lynx forest types occurs on Federal lands. Of all western forest types, the western boreal forests (subalpine fir/spruce forests which provide lynx habitat) have the highest proportion of reserved land, largely because they are primarily in public ownership and are the least productive timberland, making land use

trade-offs between preservation and extraction less controversial than for other public lands (Agee 1999). Human land use that changed areas of forest land, disturbance patterns, and dominant tree species is much less prevalent in the West than in the Great Lakes or Northeast boreal forest (Agee 1999). Broad-scale habitat assessments generally support these conclusions.

Large amounts of lynx forest types occur on Federal lands, within both developmental and nondevelopmental allocations within the western regions. Lands in developmental allocations are managed for multiple uses, such as recreation and timber harvest. Lands within nondevelopmental allocations are to be managed to allow natural ecological processes to dominate (United States Forest Service and Bureau of Land Management 1999). Nondevelopmental lands contain large portions of wilderness or other natural areas (D. Prevedal, United States Forest Service, *in litt.* 1999). Timber harvest and construction of roads typically do not occur or are very limited in lands managed in nondevelopmental allocations. Large proportions of Federal lands in each of the western regions are managed under nondevelopmental allocations. In an assessment of the Columbia River Basin of eastern Washington and Oregon, Idaho, and western Montana, more than 35 percent of cold forest types encompassing subalpine fir/spruce habitats, were in designated wilderness, wilderness study areas, or other administrative natural areas (United States Department of Agriculture and United States Department of the Interior 1997).

Raphael *et al.* (1999) developed a broad-scale landscape model for lynx that assessed conditions across the Columbia River Basin. The model was based on the changes from historic to current amounts of habitat, landscape mosaics, disturbance regimes, vegetation structures, road densities, and human population. The model produced two outcomes, a habitat outcome and a population outcome. We acknowledge that such coarse-scale analyses may not reflect finer-scale environmental requirements that potentially account for a large amount of variation in lynx demographics. Preliminary results of the model suggest that lynx habitat is broadly distributed and of high abundance (relative to historic conditions) across the historic range of the species in the Columbia River Basin, and provides opportunity for intraspecific interactions for the species (Raphael *et al.* 1999). The model's population outcome for lynx suggests that the potential distribution of lynx in this area is restricted and characterized by patchiness and/or areas of low abundance. There is opportunity for subpopulations in most of the specie's range in this area to interact as a metapopulation; however, some subpopulations are essentially isolated.

At finer scales of analysis, the Forest Service and BLM concluded that many Forest and BLM administrative units have land and resource management plans that may adversely affect lynx due to timber harvest activities (United States Forest Service *et al.* 1999; United States Forest Service and Bureau of Land Management 1999). These plans may affect individual lynx or local lynx populations primarily in the developmental allocation areas of the Northern Rockies/Cascades and Southern Rockies regions, although the assessment did not quantify the level of impact.

Since publication of the proposed rule, we have received information related to past and projected timber harvest levels and precommercial thinning activities on Federal lands in the West. Timber harvest levels on Federal lands in the West have declined consistently and dramatically (approximately 80 percent) over the past decade or longer (R. Gay, United States Forest Service, *in litt.* 1999). Timber harvest in specific lynx forest types also has concurrently declined in the Northern Rockies (B. Ballenbacher, United States Forest Service, *in litt.* 1999; B. Ferguson, United States Forest Service, pers. comm. 1999) and Cascades (Fred Zenson, United States Forest Service, pers. comm. 1999), and the Southern Rockies (B. Short, United States Forest Service, *in litt.* 1999).

The Forest Service's projected need for future precommercial thinning on Forest Service lands over the next decade in the Northern Rockies, Cascades, and Southern Rockies will affect less than approximately 1–4 percent of primary lynx forest types within each of these regions (B. Ballenbacher, United States Forest Service, *in litt.* 1999; B. Ferguson, United States Forest Service, pers. comm. 1999; B. Short, *in litt.* 1999; F. Zenson, United States Forest Service, pers. comm. 1999). Past thinning and timber harvest impacted similarly low proportions of lynx forest types on Federal lands in the Northern Rockies (B. Ballenbacher, *in litt.* 1999; B. Ferguson, pers. comm. 1999), Cascades (F. Zenson, pers. comm. 1999) and the Southern Rockies (B. Short, *in litt.* 1999). Precommercial thinning has occurred in approximately one-fifth (B. Ballenbacher, *in litt.* 1999) to one-half (B. Short, *in litt.* 1999) of the early successional vegetation created by timber harvest in lynx forest types on western Federal lands over the past decade. This likely reduced snowshoe hare habitat quality at local scales, adversely affecting individual lynx. However, considering the overall proportions of lynx forest types affected, timber harvest and precommercial thinning on Federal lands are not currently conducted, nor are they likely in the projected future to be conducted, at levels likely to impact lynx at the population level.

However, the Northern Rockies encompass more privately owned lynx forest types than elsewhere in the West. Almost one-third of lynx forest types are in private ownership. Although we lack specific information, large portions of this habitat likely occur on privately owned corporate timber lands where timber harvest and thinning occurs. There are no data available on these private lands which would allow us to make a conclusion concerning the quality of lynx and snowshoe hare habitat. However, there is a potential for current and future management of these lands to adversely affect lynx.

Most lynx forest types in the West occur on Federal lands, and large Federal acreage of this habitat in the Northern Rockies/Cascades and Southern Rockies are managed in nondevelopmental status, where timber harvest activities and precommercial thinning generally do not occur. Nondevelopmental allocations on Federal lands require that natural ecological processes play a dominant role in the landscape (United States Forest Service and Bureau of Land Management 1999), as opposed to developmental lands, which are managed for multiple uses, such as recreation and timber harvest.

Large portions of nondevelopmental lands occur in the Northern Rockies and Cascades regions, which encompass most of the lynx forest types in Wyoming, Utah, Montana, Idaho, Oregon, and Washington. We recognize the importance of wildlands and nondevelopmental lands in the Northern Rockies/Cascades Region to provide lynx habitat that is buffered from many human impacts, creating the most likely stronghold for lynx populations in the contiguous U.S.

In the Northern Rockies, nearly 50 percent of the 35 million acres of lynx forest types is in nondevelopmental allocations on Forest Service lands or occurs in National Parks. In the Northern Rockies, 67 percent of the lynx forest types are managed by the Forest Service, 5 percent by the BLM, and 28 percent are in other ownerships (see

"Table 1"). The Forest Service and BLM manage over 24 million acres of lynx forest types. Of federally managed lynx forest types, 57 percent (roughly 14 million acres) lies within areas with nondevelopmental status. Sixty-seven percent of this 14 million acres lie within wilderness or scenic river designations (D. Prevedal, *in litt.* 1999), both of which provide restrictions on land use beneficial to lynx. Additional large tracts of lynx forest types occur in Glacier (735,310 acres) and Yellowstone (1,910,590 acres) National Parks (D. Prevedal, *in litt.* 1999). However, the 43 percent of federally managed lynx forest types that are in developmental status are managed for multiple uses that may, on local scales, conflict with lynx conservation.

TABLE 1.—AMOUNT OF LYNX FOREST TYPES IN GEOGRAPHIC REGIONS IN THE CONTIGUOUS U.S., AMOUNT OF LYNX FOREST TYPES (LFT) ON FOREST SERVICE (FS) AND BUREAU OF LAND MANAGEMENT (BLM) LANDS, AND FEDERAL LAND ALLOCATIONS IN LYNX FOREST TYPES (DATA FROM U.S. FOREST SERVICE AND BUREAU OF LAND MANAGEMENT 1999)

Geographic region	Total acres LFT, all ownerships	Total acres LFT on FS/BLM	Total acres FS/BLM LFT non-developed allocations	Percent LFT on FS/BLM	Percent FS/BLM LFT in nondeveloped allocations	Percent all LFT in nondeveloped allocations
Cascades	4.2 M	4.1 M	3.6 M	99	87	85
Northern Rockies	34.3 M	24.8 M	14.1 M	72	57	41
Southern Rockies	6.5 M	5.3 M	1.4 M	82	25	23

The Cascades and Southern Rockies regions encompass substantively smaller proportions of lynx forest types. In the Cascades Region, 99 percent of lynx forest types are managed by the Forest Service, less than 1 percent by the BLM, and less than 1 percent is in other ownerships (see "Table 1"). The Forest Service and BLM manage approximately 4 million acres of lynx forest types. Of federally managed lynx forest types, 87 percent (3.5 million acres) lies within areas with nondevelopmental allocations and 13 percent occur in areas of developmental status, where multiple use management occurs. Ninety percent of this 3.5 million acres is in wilderness or in key watersheds under the Pacific Northwest Forest Plan, and the remaining 10 percent is in matrix lands including late successional reserves, which allows limited timber harvest such as salvage harvest (D. Prevedal, *in litt.* 1999). In Washington and Oregon, the National Park Service manages an additional 200,000 acres of lynx forest types (D. Prevedal, *in litt.* 1999).

In the Southern Rockies, 76 percent of the lynx forest types are managed by the Forest Service, about 5 percent by the BLM, and 19 percent is in other ownerships (see "Table 1"). Federally managed lynx forest types amount to over 5 million acres. Of the federally managed lynx forest types, only 25 percent (1.4 million acres) lies within areas with nondevelopmental status while the other 75 percent are in developmental status and are managed for multiple uses that may, on local scales, conflict with lynx conservation.

Considering the Northern Rockies, Cascades and Southern Rockies, a cumulative total of 56 percent of Forest Service and BLM lands is managed in nondevelopmental status, comprising over 40 percent of lynx forest types, allowing for 44 percent to be managed for multiple uses which may conflict with lynx conservation. National Parks in the western regions add several million acres of lynx forest types in more or less undeveloped status.

We conclude that timber harvest activities and precommercial thinning may reduce the quality of snowshoe hare habitat and red squirrel habitat in local areas of the Northern Rockies/Cascades and Southern Rockies, and thus may negatively affect lynx at local scales. Furthermore, the large percentage of Federal lands in developmental status and managed for multiple use may, on local scales, conflict with lynx conservation. However, based on the large proportion of lynx forest types managed in nondevelopmental status compared to the proportion of managed lynx forest types affected, current regional effects of timber harvest and thinning appear to occur at levels that are not likely threatening the Northern Rockies/Cascades and Southern Rockies lynx populations.

Federal land management in developmental allocations often maintains conditions suitable for lynx, and these lands constitute important landscapes providing regional connectivity. Construction of roads, timber harvest, and fire suppression occur in developmental allocations. However, recent studies of lynx have documented lynx presence and reproduction in a variety of managed landscapes (Koehler 1990; Staples 1995; Apps 1999; Squires and Laurion 1999; J. Organ, U.S. Fish and Wildlife Service, pers. comm. 1999). Lynx occurrence records provide evidence that lynx continue to be broadly distributed throughout lynx forest types in the Northern Rockies/Cascades and Southern Rockies (McKelvey *et al.* 1999b), both inside and outside of the nondevelopmental allocation areas within the last decade (U.S. Forest Service and Bureau of Land Management 1999).

Because of the preponderance of lynx forest types on Forest Service, BLM, and National Park system lands, Federal land management assumes the largest single role in the conservation of lynx in western portions of its range. We believe that the large amounts of lynx forest types managed in nondevelopmental allocations, especially in designated wilderness areas, protects lynx in the Northern Rockies/Cascades and Southern Rockies and contributes to the likelihood of persistence of lynx into the future. The forests upon which lynx depend have had less timber harvest, road construction, and have been modified much less than other drier forests (U.S. Forest Service and Bureau of Land Management 1997). In addition, significant portions of these forests are within areas that do not have roads and have habitat that has been classified as wilderness. Natural fires are more likely allowed to burn in wilderness or areas without roads, which helps retain diversity in structural stages and create habitat mosaics in forests for the future. Also, in the Northern Rockies/Cascades Region there are strong habitat connections to lynx populations in

Canada. The Northern Rockies/Cascades Region has the highest potential for maintaining a viable lynx population within the DPS, based upon the large amount of lynx forest types, the large portions of habitat in nondevelopmental management, and strong regional connections to lynx forest types and lynx populations in Canada.

Natural fire has an important role in forest ecology in western mountain ranges of the United States. Some researchers believe that fire suppression during the past 50 years has allowed certain forest types to mature, thereby reducing habitat suitability for snowshoe hares and Canada lynx (Brittell *et al.* 1989; Fox 1978; Koehler 1990; Washington Department of Wildlife 1993; T. Bailey, U.S. Fish and Wildlife Service, *in litt.* 1994; W. Hann, U.S. Forest Service, *in litt.* 1999).

However, others argue that fire suppression is most likely affecting lynx habitat in areas where the historical frequency of fires is shorter than the length of time fires have been suppressed (P. Stickney, U.S. Forest Service, pers. comm. 1994; Agee 1999). Fire suppression in areas with a history of infrequent fire has probably not had much impact (Habeck 1985; Agee 1993). In the western boreal forest zone, long natural fire return intervals (150–300 years) signify that removal of fire has not been as significant as in the West with lower-severity fire regimes and return intervals (30–90 years), even though fire suppression has been in effect for much of this century (Agee 1993, Agee 1998 *in* Agee 1999). More frequent fires of lower intensity do occur in some boreal forest types (W. Hann, *in litt.* 1999), although they typically comprise a small proportion of the total area burned (Agee 1999). In forests with high-severity fire regimes, a number of smaller fires burn a small proportion of the forests, while fewer larger fires account for most of the area burned (McKelvey and Busse 1996 *in* McKelvey *et al.* 1999d; Agee 1999). Lynx forest types in the West include a preponderance of forest types with long natural fire return intervals and high-fire intensity (S. Arno, U.S. Forest Service, *in litt.* 1998; Agee 1999), which suggests that removal of fire in lynx forest types has not been as significant as in the lower-severity fire regimes of the West (Agee 1998 *in* Agee 1999).

In the Northern Rockies, most of the wilderness areas in Montana and Idaho have fire management plans that affect more than 5 million acres that allow naturally caused fires to burn during certain periods and in certain areas (N. Warren, U.S. Forest Service, *in litt.* 1999). In Wyoming and Utah, one-third of the wilderness areas also have completed similar fire plans, with the remaining plans close to completion (B. Noblit, U.S. Forest Service, *in litt.* 1999). Glacier and Yellowstone National Parks allow natural fires to burn under many conditions. In the Cascades, two of three wilderness areas have fire management plans in place (B. Naney, U.S. Forest Service, Okanogan, pers. comm. 1999). Further, the 1994 Federal Wildland Fire Policy directs the Department of the Interior and the Department of Agriculture to use a full range of potential responses to fire, from full suppression to allowing more fires to burn large areas thereby allowing fires to assume a larger role in maintaining forest health in the future (B. Meuchel, pers. comm. 1999; D. Milburn, pers. comm. 1999). However, natural fire regimes are not necessarily restored because prescriptive criteria to manage these natural wildland fires remain conservative.

Currently, outside large wilderness areas in all western regions, most fires are suppressed. Most fires (98 percent) are successfully extinguished when small and only a small proportion of fires burn large areas (B. Meuchel, U.S. Forest Service, pers. comm. 1999; D. Milburn, U.S. Forest Service, pers. comm. 1999). Fires are extinguished largely due to costs, firefighter safety, local human safety and property concerns. The majority of these fires occur outside lynx forest types at lower elevations in drier forests. However, fires igniting in the lynx forest types outside, and some fires inside, wilderness are suppressed, which can reduce the amount of early seral forests compared to natural conditions and/or change species composition and structural components of forests (W. Hann, *in litt.* 1999). The total area that would have burned had such fires been allowed to burn is likely not substantive when compared to the proportion of the landscape burned by the large, high-intensity fires typical of lynx forest types. However, the resulting pattern of vegetation mosaic and the mix of stand age classes may be altered, as the large fires may burn areas more uniformly due to lack of fire breaks that would have been created by past, smaller fires (D. Milburn, pers. comm. 1999). Other natural processes such as insects, disease, and wind-throw also can play a role in affecting the vegetation mosaics.

Based on available information on fire suppression and upon available habitat assessments, we conclude that at the present time, fire suppression effects are less evident in lynx forest types than in many other forest types in the West. In the Cascades, fire return intervals in many lynx forest types are very long, 200–500 years (Agee 1999). Mixed-severity fire regimes were not common; therefore, fire suppression is not a factor limiting lynx in the Cascades. In the Northern and Southern Rockies, fire intervals also are long and fire regimes are typically intense (Agee 1999). Where mixed-severity fire regimes occur in the Northern and Southern Rockies, lynx habitat quality may be affected at some local scales, especially outside of wilderness areas, resulting in adverse effects to individual lynx. However, considering a larger scale, the current effects of fire suppression alone are not threatening the Northern Rockies/Cascades and Southern Rockies lynx at the population level at this time.

While recent studies of lynx have documented lynx presence and reproduction in a variety of managed landscapes (Koehler 1990; Staples 1995; Apps 1999; Squires and Laurion 1999; J. Organ, U.S. Fish and Wildlife Service, pers. comm. 1999), we remain concerned about the maintenance of lynx habitat conditions, especially since a large percentage of lands managed by the Forest Service and BLM are in developable status and allow programs, practices and activities that may impact lynx and their primary prey, snowshoe hare. Lynx occur naturally at very low densities in the contiguous United States (see "Background" section). It is imperative that snowshoe hare and alternate prey populations be supported by habitat on Federal lands into the future, to ensure the persistence of lynx in the contiguous United States. Substantive declines in prey species, especially snowshoe hare, may result in a prey base insufficient to support lynx populations. Therefore, amendment of Forest Plans to provide protection for lynx and lynx habitat is needed to conserve habitat for lynx and its prey on Federal forest lands. Without such amendments, the species is threatened.

Northeast

In the Northeast Region, softwoods that provided Canada lynx habitat were logged extensively during the late 1800s and early 1900s (Jackson 1961; Barbour *et al.* 1980; Belcher 1980; Irland 1982). Over a short time period, timber extraction during this era resulted in the replacement of late-successional conifer forest with extensive tracts of very early successional habitat, which eliminated cover for lynx and hare (Jackson 1961; Keener 1971). In the Northeast Region, slash, accumulated during logging operations, fueled wildfires that burned vast acreage of softwood forest (Belcher 1980; J. Lanier, pers. comm. 1994). This

sudden alteration of habitat may have resulted in sharp declines in snowshoe hare numbers over large areas, subsequently reducing lynx numbers (Jackson 1961; Keener 1971; K. Gustafson, pers. comm. 1994; J. Lanier, pers. comm. 1994).

The impacts of the logging conducted in the Northeast Region during the late 1800s continue to affect lynx forest types. In Maine, softwood cover and dense sapling growth provided improved snowshoe hare habitat after timber harvest and fires in late successional forests (Monthey 1986). However, in the western sections of the Northeast Region, extensive tracts of predominantly softwood forests that were harvested and burned-over during the late 1800s and early 1900s were subsequently replaced with regenerating hardwoods (D. Degraff, pers. comm. 1994; J. Lanier, pers. comm. 1994). Hardwood forests do not typically supply adequate cover for snowshoe hares (Monthey 1986). For a period of time, this extensive area would have provided the early successional habitat used by snowshoe hare. However, such extensive tracts may not have provided a suitable mosaic of forest habitats and as succession progressed, these large tracts eventually became unsuitable for both snowshoe hare and lynx. Declines in snowshoe hare habitat may have occurred during the 1940s and 1950s as a result of large-scale forest maturation (Litvaitis *et al.* 1991).

In Maine, large tracts of forest (some as large as 36-square mile townships) were harvested in the 1960s to reduce the incidence of spruce budworm. During early successional stages, these forests may provide high quality hare habitat. However, these large tracts create a simplified, monotypic forest over large areas, not a mosaic of forest stands. Passage of the State Forestry Practices Act has required clear-cut size to be substantially reduced. The Maine Department of Conservation recently analyzed Statewide timber production on Maine's 17 million acres of forest land (Gadzik *et al.* 1998). The report indicated 25 percent of the forest was in seedling/sapling stages, which likely includes quality snowshoe hare habitat. However, the report concludes that increasing the number of acres under high-yield silvicultural practices, which will likely include precommercial thinning, to a cumulative total of 9 percent of Maine's forest land by the year 2015 is necessary to sustain the current timber harvest levels into the future. Such high-yield techniques may temporarily reduce snowshoe hare habitat quality, but the long-term effects on lynx on a landscape scale are not known.

Forested habitat in the Northeast has increased because of land-use changes during the past century (Irland 1982; Litvaitis 1993), including the abandonment of agriculture in many areas. In some areas there may be a gradual upward trend in the coniferous component as spruce and fir regenerate beneath hardwood species (D. Degraff, pers. comm. 1994). Several of the northeastern States support adequate, if not abundant, snowshoe hare populations (C. Grove, Green Mountain National Forest, pers. comm. 1994; F. Hurley, *in litt.* 1994; J. Lanier, pers. comm. 1994).

In 1990, the Forest Service published a report that examined the Northern Forest Lands in New York, Vermont, New Hampshire, and Maine (Harper *et al.* 1990). Eighty-four percent of northern forest lands in the region are currently privately owned and 16 percent are in public ownership. According to another analysis, the Forest Service manages only 7 percent of lynx forest types in the Northeast, of which 23 percent is managed in nondevelopmental status (U.S. Forest Service and Bureau of Land Management 1999). Federal land management will have minimal effect on the persistence of lynx in the Northeast, due to the small amount of lynx forest types managed by the Forest Service.

Commercial forestry continues to be the dominant land use on 60 percent of the private lands in northeastern forests. The rapid pace of subdivision for recreational home sites has been identified as a concern in maintaining the integrity of Northeast forests (Harper *et al.* 1990), though this is not currently posing a significant threat to lynx. At higher elevations and northern latitudes in the Northeast, red spruce and balsam fir are important components of snowshoe hare habitat. Declines in red spruce forests have been documented, and drought, acid deposition, and other human-generated pollutants have been suggested as principal causes (Scott *et al.* 1984). Historic declines in some forest types may have contributed to reducing the quality of lynx habitat in the Northeast. Current lynx research in Maine is contributing to our knowledge about lynx habitat use in the Northeast (J. Organ, pers. comm. 1999).

In Northeast forests, fire return intervals are very long, due to the moist maritime influence (Agee 1999). Thus, fire did not historically play a significant role in creating early successional habitats. Insect infestations and wind were the primary disturbance events that created early successional habitats. While current fire suppression on public and private lands may have localized effects, it is not likely affecting overall lynx forest types in the Northeast. We conclude that fire suppression in the Northeast does not threaten lynx subpopulations there.

We conclude that most lynx forest types are in private, State, or county ownership in the Northeast. Timber harvest and associated activities exert the most influence on lynx forest types in the Northeast, although the extent of influence of current forest practices on lynx is not known.

Great Lakes

In the Great Lakes Region, as in the Northeast, softwood forests were logged extensively during the late 1800s and early 1900s (Jackson 1961; Barbour *et al.* 1980; Belcher 1980; Irland 1982) and over a short period resulted in the replacement of late-successional conifer forest with extensive tracts of very early successional habitat, which eliminated cover for lynx and hare (Jackson 1961; Keener 1971). Coniferous forests also were cleared for agriculture during this period in the Great Lakes.

In the Great Lakes Region, the Forest Service manages about 19 percent of the area within which lynx forest types occur, of which 40 percent is managed in nondevelopmental status (U.S. Forest Service and Bureau of Land Management 1999). The remaining 80 percent of the area encompassing lynx forest types in the Great Lakes is in State, county, or Tribal lands, or is privately owned. Public or Tribal ownership accounts for 41 percent of all lynx forest types in the region (J. Wright, *in litt.* 1999 in U.S. Forest Service *et al.* 1999).

Timber harvest levels on Federal lands in the Great Lakes have declined by approximately 20 percent over the past decade (R. Gay, U.S. Forest Service, *in litt.* 1999). While specific information on timber harvest levels or pulpwood production on non-Federal lands in the Great Lakes was not available, timber harvest is generally prevalent on these lands. Past habitat fragmentation likely occurred from forestry management programs, agricultural conversions, residential development and highways. As in the Northeast, regenerating forests now occupy abandoned farmlands in northern portions of the Great Lakes. However, mixed conifer/hardwood stands are often replaced by pure deciduous seral stands, which have been maintained in deciduous stages in recent years because of the importance of aspen as a crop tree (Agee 1999). In the East, hare densities were higher in

coniferous forests than deciduous (Litvaitis *et al.* 1985; Fuller and Heisey 1986). On managed timber lands in all ownerships, the maintenance of aspen seral components to produce pulpwood precludes the establishment of coniferous forest types, which in turn likely diminishes snowshoe hare habitat quality, adversely impacting lynx.

In the Great Lakes, natural fire regimes are frequent and intense (Agee 1999). Fire suppression in the Great Lakes area has changed the dominant successional pathways, perhaps permanently (Agee 1999). However, in the northeastern portion of Minnesota fires are allowed to burn in the Boundary Waters Canoe Area. This portion of the Great Lakes Region may provide the highest quality lynx habitat, as the largely coniferous forests here more closely resemble the northern boreal forests of Canada than do the transitional coniferous/deciduous forests to the south. On other Federal lands in the Great Lakes, fire suppression policies are such that fire is unlikely to assume its natural role in creating a mosaic of vegetation communities and age classes across the landscape. Escaped fires and other natural processes such as insects, disease, and wind throw maintain natural mosaics to some degree. Lynx foraging habitat is likely to be maintained at levels less than would be provided under natural disturbance regimes. Fire suppression is likely reducing the quality of lynx habitat in the Great Lakes.

Most lynx forest types are in private, State, or county ownership in the Great Lakes and timber harvest is prevalent on these lands. We conclude that timber harvest and fire suppression may be impacting lynx and prey habitat in the Great Lakes Region.

However, we further conclude that timber harvest and fire suppression may have regional or local impacts but do not currently threaten the contiguous United States population. Considering the entire United States distinct population segment, we remain concerned about maintenance of lynx habitat conditions, especially in areas outside nondevelopmental lands in the West. It is imperative that snowshoe hare and alternate prey populations be supported by habitat on Federal lands into the future, to ensure the persistence of lynx in the contiguous United States. We conclude that the single factor threatening the contiguous United States distinct population segment of lynx is the lack of guidance for conservation of lynx and snowshoe hare habitat in National Forest Land and Resource Plans and BLM Land Use Plans (see "Factor D" of the "Summary of Factors" section). This lack of guidance allows the potential for future degradation of lynx habitat on Federal lands through timber management and other Federal activities (see "Factor D" of the "Summary of Factors" section).

Factor B. Overutilization for Commercial, Recreational, Scientific, or Education Purposes

One of the primary reasons we proposed to list lynx, based on available information at the time, was our conclusion that the low numbers of lynx in the contiguous United States and southern Canada were the residual effects of overtrapping that was believed to have occurred in the 1970s and 1980s, in response to unprecedented high pelt prices, a concern that was widely shared (Brand and Keith 1979; Todd 1985; Bailey *et al.* 1986; Hatler 1988; Washington Department of Wildlife 1993).

Since the publication of the proposed rule, we have received substantive new information related to relative numbers of lynx in the northern and southern portions of its range. We now understand that lynx in the contiguous United States always existed at low densities, comparable to lynx populations of the northern boreal forest during cyclic lows (Aubry *et al.* 1999) (see "Background" and "Distribution and Status" sections). These low densities of lynx do not appear to be the result of declining population trends. Rather, lynx are relatively rare in the contiguous United States because of habitats that are inherently unable to support cyclic, high-density snowshoe hare populations and are thus unable to sustain cyclic, high-density lynx populations.

Trapping records are the best, long-term lynx data available. Harvest returns are generally indicative of, but do not represent, real population changes because of the number of factors that influence trapper effort and success, such as changes in socioeconomic conditions, season length, quotas and trapping restrictions, and ease of access (Hatler 1988; Mowat *et al.* 1999). Mowat *et al.* (1999) suggest that fur prices likely affect harvest over the short-term but that it may not be valid to compare and contrast inflation-adjusted prices and harvests that occurred decades apart. Mowat *et al.* (1999) conclude trapping can reduce lynx numbers and that lower lynx harvest levels in Canada in the first half of the 20th century were possibly a result of overtrapping. However, prior to 1921, harvest data were maintained by the Hudson Bay Company. Lower lynx harvest returns in Canada coincide with Hudson Bay Company's going out of business and Provinces starting to maintain harvest records; we surmise that the lower harvests are, at least in part, more likely an artifact of changes in recordkeeping.

Human-induced mortality was generally believed to be the most significant source of lynx mortality (Ward and Krebs 1985). Trapping mortality was considered to be entirely additive (i.e., in addition to natural mortality) rather than compensatory (taking the place of natural mortality) (Brand and Keith 1979). However, Canadian researchers determined that natural mortality during the declining phase of the lynx cycle is high; therefore, trapping mortality during some portions of the cyclic decline may compensate for natural mortality (Hatler 1988; Poole 1994; Slough and Mowat 1996; Poole 1997; Mowat *et al.* 1999). Therefore, we recognize that trapping of lynx can be both additive and compensatory, depending on when it occurs in the cycle.

From the mid-1970s until the late 1980s, prices of lynx pelts were at record highs throughout the United States and Canada (Todd 1985; Hatler 1988; Hash 1990). In Montana, the 1974 average pelt price was $63; by 1978 the average price increased over 500 percent to $348 (B. Giddings, *in litt.* 1994). Lynx pelt prices peaked in the mid-1980s at nearly $500 per pelt and remained above $200 per pelt for 12 years until 1989 (B. Giddings, *in litt.* 1994).

In response to declining harvests in the late 1970s and 1980s, Washington, Montana, Minnesota, Alberta, British Columbia, Manitoba, Ontario, Quebec, and Alaska severely restricted or closed their lynx harvest seasons because of concern that lynx populations had been overexploited (Bailey *et al.* 1986; Hatler 1988; Hash 1990; Washington Department of Wildlife 1993; S. Conn, *in litt.* 1990; M. DonCarlos, *in litt.* 1994; B. Giddings, *in litt.* 1994; R. McFetridge, Alberta Environmental Protection, *in litt.* 1994; I. McKay, *in litt.* 1994).

Based on information obtained since the proposed rule, we now recognize that the cyclic peak harvest returns of the early 1960s and 1970s were unprecedented highs for the 20th century (e.g., Figures 8.3 and 8.6 in McKelvey *et al.* 1999b; Figure 9.4 in Mowat *et al.* 1999). Wildlife managers may have expected harvest returns during the 1980s and 1990s to be comparable to the anomalous cyclic peaks of the 1960s and 1970s. When harvest returns failed to be as high as anticipated, managers appear to have interpreted the lower returns to be caused by overtrapping when pelt prices

were high (Bailey *et al.* 1986; Hatler 1988; Hash 1990; Washington Department of Wildlife 1993). We compared the lynx harvest returns in the 1980s and early 1990s to harvest data dating back over a longer period of time (i.e., prior to 1960) and found that lynx harvest returns were not unusual nor appreciably lower than those recorded prior to the 1960s.

Trapping data for the contiguous United States during the 1970s and 1980s is available from Minnesota, Montana, and Washington. Only Minnesota has long-term trapping records (Henderson 1978). Minnesota lynx harvest data indicate cycles approximately every 10–12 years (McKelvey *et al.* 1999b). Lynx harvest in Minnesota was relatively high, but also highly variable, ranging from as low as 0 to as high as 400 per year over the 40 years of recordkeeping (Henderson 1978). The Minnesota harvest is believed to have consisted, at least partially, of lynx dispersing from Canada (Henderson 1978; McKelvey 1999b). The amplitude of Minnesota lynx harvest cycles was high and, therefore, the exceptionally high peaks of the early 1960s and 1970s that are evident in all other regions do not appear extraordinary in the Minnesota data. After two seasons in the mid-1970s when no lynx were harvested, a quota of five lynx was established from 1977 through the 1982 season. This quota presumably influenced trapper effort and likely was a factor in the reduced harvests in the late 1970s and early 1980s. However, the quota was always exceeded by at least three times the quota. Although the quota was further reduced to two in 1983, nine lynx were taken, providing evidence of the continued occurrence of lynx in Minnesota. The Minnesota lynx season has been closed since 1984. Given the history of lynx cycles reflected in Minnesota data, a cycle would have been expected to return between 1983 and 1985. However, strict season limits were in place or the season was closed so that evidence of cycles from harvest data is not available after the mid-1980s. During the decade preceding the 1984 closure, over 160 lynx were trapped despite restrictive quotas beginning in 1977. These levels of harvest do not differ substantially from previous cyclic lows considering the effects of restrictive quotas on trapper effort.

Montana has maintained lynx harvest records since 1950 (see Figure 8.5 in McKelvey *et al.* 1999b). The most conspicuous features of the data are the cyclic peaks in the 1960s and 1970s. There is no clearly evident peak in the 1950s. In the mid-1980s, in response to concerns that lynx were being overharvested when returns did not compare to those of the 1960s and 1970s, Montana set lynx trapping quotas. Over successive years, initial annual quotas were set at 135, 120, and 100, but were established without the benefit of long-term harvest data to gauge the range of cyclic highs and lows. These quotas were not filled. However, if returns in the 1950s are a better indication of average long-term harvest, it is possible that these quotas were unrealistically high. Further, despite the quotas, a small cyclic peak is evident in the early 1980s. Since 1991, the quota has been very low, two annually, and has been filled or slightly exceeded every season. The low quota likely affects trapper effort and masks any recent population cycles that could have been reflected in harvest data. Beginning with the 1999 season, all lynx trapping is closed in Montana unless another State is in need of lynx for a reintroduction, in which case five lynx can be taken and translocated to the reintroduction site.

Harvest data for Washington is available only since 1960 (Figure 8.7 in McKelvey *et al.* 1999b). Without harvest information prior to 1960, we cannot know the range of cyclic lows and highs over time in Washington. The 1960s and 1970s cyclic highs are evident in the harvest data, but the data do not clearly track a 10-year cycle. Following the 1970s peak, there were five seasons during which no lynx were harvested. As a result, low quotas were set and seasons were shortened. However, despite the low quotas and restricted seasons, harvest returns increased during the final three seasons of the 1980s and the numbers of lynx harvested were high relative to past records. The final season in 1989 was the fifth highest return ever recorded in Washington. Although the data is limited, the annual number of lynx harvested increased in the late 1980s, perhaps leading to or indicative of a cyclic high. No harvest data are available since a Statewide lynx trapping closure went into effect in 1990.

At the time that Washington, Minnesota, and Montana closed their seasons, lynx were still being trapped, which demonstrates that lynx persisted in these States. We recognize that the States did not have lynx population trend information and so relied on trapping data, deciding to take conservative measures when trapping returns decreased.

Mowat *et al.* (1999) suspected that high harvest pressure during the low phase in the lynx cycle of the mid-1980s or where trapping intensity was severe may have had more of an impact on lynx populations in the southern part of the range (southern Canada and the contiguous U.S.) than on northern lynx populations (Canada and Alaska) (Mowat *et al.* 1999). Mowat *et al.* (1999) also expected that dispersal by lynx from healthy populations will lead and has led to the repopulation of areas where overtrapping had depleted the local lynx population. Mortality of lynx through legal trapping has been virtually eliminated in the contiguous United States, except in locations where Tribal regulations permit the taking of lynx. We now believe that ongoing precautions taken by States and Provinces to restrict lynx trapping since the 1980s possibly prevented the overharvest of resident populations of lynx. However, the lack of available data (trapping or otherwise) for the past 15 years makes it difficult to discern the effect trapping restrictions may have had on resident populations.

We conclude that in the contiguous United States, lynx populations occur at naturally low densities; the rarity of lynx at the southern portion of the range compared to more northern populations is normal. The rarity of lynx is based largely on limited availability of primary prey, snowshoe hares. At southern latitudes, low snowshoe hare densities are likely a result of the naturally patchy, transitional boreal habitat. Such habitat prevents hare populations from achieving high densities similar to those in the extensive northern boreal forest (Wolff 1980; Buehler and Keith 1982; Koehler 1990; Koehler and Aubry 1994; Hodges 1999a, 1999b; McKelvey *et al.* 1999c). Comparatively low numbers of lynx in the contiguous United States occur not as a result of overtrapping, but because lynx and their prey are naturally limited by fragmented habitat, topography, and climate.

Legal trapping activities for bobcat, coyote, wolverine and other furbearers create a potential for incidental capture of lynx. The threat to resident lynx from legal trapping for other species may be limited in many areas because bobcat or coyote trapping generally occurs outside of areas where lynx would be found, although we know that incidental capture occurs (Wydeven 1998; M. DonCarlos *in litt.* 1994; R. Naney, U.S. Forest Service, pers. comm. 1999). Although we are concerned about the loss of lynx that are incidentally captured, we have no information to indicate that the loss of these individuals has negatively affected the overall ability of the contiguous United States DPS to persist. Additionally, we

believe that lynx have been incidentally trapped throughout the past, and still they persist throughout most of their historic range.

In summary, we conclude that past and present overutilization is not a factor threatening lynx.

Factor C. Disease or Predation.

Disease and predation are not known to be factors threatening Canada lynx.

Factor D. Inadequacy of Existing Regulatory Mechanisms

For the reasons discussed below, existing regulatory mechanisms do not adequately address the needs of the lynx, or reduce the threats to the species or its habitat. Within the contiguous United States range of the lynx, all States, except Oregon, provide the lynx regulatory protection by specifically prohibiting hunting and trapping for lynx. However based on pelt tags records we believe that Oregons trapping programs have not resulted in take of any lynx (Carol Carson, pers. comm. OMA, 2000). Four States classify the lynx as endangered—Vermont (1972), New Hampshire (1980), Michigan (1987), and Colorado (1976). Lynx are classified as "threatened" in Washington (1993), "sensitive" in Utah (1979), and "species of special concern" in Maine (1997), and in Wisconsin are "protected" (1997).

Five States classify lynx as small game or furbearers with closed seasons—Idaho (1997), New York (1967), Minnesota (1984), Wyoming (1973), and Montana (1999). It is legal to harvest lynx in Oregon because the lynx is not protected under Oregon State Law. However based on pelt tags records we believe that Oregons trapping programs have not resulted in take of any lynx (Carol Carson, pers. comm. OMA, 2000). The contiguous United States range of the lynx extends across tribal reservation lands and ceded territories of numerous Tribes. Lynx trapping and hunting are permitted under the regulations of some Tribes, although the Confederated Salish and Kootenai Tribes of the Flathead Nation have prohibited the trapping and taking of lynx since 1986 (M. Pablo, Confederated Salish and Kootenai Tribes Tribal Council, *in litt.* 1998). In the Great Lakes Region, lynx harvest is prohibited on off-reservation ceded lands by the Voigt Intertribal Task Force of the Great Lakes Indian Fish and Wildlife Commission and the 1854 Authority of the Bois Forte and Grand Portage Bands (J. Schlender, Voigt Intertribal Task Force of the Great Lakes Indian Fish and Wildlife Commission, *in litt.* 1998; M. Schrage, Fond du Lac Resource Management Division, *in litt.* 1998; M. Myers and A. Edwards, 1854 Authority, *in litt.* 1999). We conclude that current hunting and trapping regulations are not threatening the continued existence of the contiguous United States DPS; however, other regulatory mechanisms, as described below, are inadequate.

Most States across the range of lynx have laws and regulations regarding environmental issues. Indirectly, these regulations may promote the conservation of lynx habitat on non-Federal lands; however, few are specific to lynx habitat conservation. Two programs in the Northeast and in Washington may provide some benefit to the species. The majority of lynx forest types in the Northeast occur on private land, ranging from small residential lots to large industrial timber company ownerships (Harper *et al.* 1990). The Northern Forest Lands Council has a charter to maintain traditional patterns of landownership and use in the Northeast; part of this effort includes a forest inventory (Northern Forest Lands Council, *in litt.* 1994). The maintenance of traditional patterns of landownership may prevent the fragmentation and/or development of lynx habitat.

In response to the Washington State Wildlife Commission listing the lynx as threatened, the Washington Forest Practices Board allowed the three primary, non-Federal land managers of Washington lynx habitat to develop "special wildlife management plans" for lynx. Upon approval by Washington Division of Fish and Wildlife, these plans were adopted in lieu of the development of forest practices rules to protect lynx habitat under the State's critical habitat designation. These three land managers have adopted and implemented lynx habitat management plans in Washington—"Lynx Habitat Management Plan for Department of Natural Resources Managed Lands" (Washington Department of Natural Resources 1996a), "North American Lynx Habitat Management Plan for Boise Cascade Corporation" (Whitwill and Roloff 1996), and a plan originally developed by Plum Creek Timber Company and adopted by Stimson Lumber Company "Salmo-Priest and Little Pend Oreille Lynx Management Plan" (Gilbert 1996; Duke Engineering and Services 1998). These plans represent efforts to improve habitat conditions for lynx in Washington, but only on State managed lands and those lands managed by the plan developers.

A substantial amount of the primary areas of lynx occurrence is on National Forest Service lands (Cascades (99 percent), Northern Rockies (67 percent), Southern Rockies (76 percent), Great Lakes (19 percent), Northeast (7 percent)) (U.S. Forest Service and Bureau of Land Management 1999). National Forest Management Act regulations (36 CFR 219.19) provide the following direction to the Forest Service—"Fish and wildlife habitat shall be managed to maintain viable populations of existing native and desired non-native vertebrate species." Additionally, the lynx is classified as a sensitive species by all Forest Service regions within the contiguous United States lynx range. There is no regulatory mandate specific to sensitive species; however, the Forest Service Manual (FSM 2670.32) provides the following policy guidance for sensitive species—"avoid or minimize impacts to sensitive species; if impacts cannot be managed to maintain viable populations, a decision must not result in loss of existing native and desired non-native vertebrate species viability or create a significant trend toward Federal listing." At present, Federal land management plans do not adequately address lynx, as described below.

The LCAS was developed to provide a consistent and effective approach to conserving lynx on Federal lands in the contiguous United States (U.S. Forest Service *et al.* 1999). The overall goals of the LCAS were to recommend lynx conservation measures, provide a basis for reviewing the adequacy with regard to lynx conservation of Forest Service and BLM land and resource management plans, and facilitate conferencing and consultation under section 7 of the Act, should the lynx be listed. The LCAS identifies an inclusive list of 17 potential risk factors for lynx that may be addressed under programs, practices, and activities within the authority and jurisdiction of Federal land management agencies. For example, these risk factors include programs or practices that result in: Habitat conversion, fragmentation or obstruction to lynx movement; roads or winter recreation trails that facilitate access to historical lynx habitat by competitors; and fire exclusion, which changes the vegetation mosaic maintained by natural disturbance processes. The risks identified in the LCAS are based on effects to either individual lynx or population segments, or both. Therefore, we do not necessarily consider all of the risks identified in the LCAS to be factors threatening the contiguous United States DPS of lynx. For example, one risk factor identified for the Southern Rockies Region is accidental death to

individual lynx from being hit by a vehicle while crossing roads. While this may result in incidental take of lynx, it is not considered to be a significant threat to the contiguous United States DPS.

The DBA determined that Federal land management plans are likely to adversely affect the lynx (U.S. Forest Service and Bureau of Land Management 1999). The DBA identified potential effects resulting from 57 Forest Service Land and Resource Management Plans (Plans) and 56 BLM Land Use Plans (Plans) within the 16-State area where lynx were proposed for listing. The direction found in the Plans was compared to direction proposed in the LCAS. If it were determined that a Plan may adversely affect either an individual lynx or a population segment through failure to meet any one of the programmatic conservation measures in the LCAS (U.S. Forest Service *et al.* 1999), then the Plan was deemed overall as likely to adversely affect lynx (U.S. Forest Service and Bureau of Land Management 1999). In other words, a risk was deemed harmful to lynx if the possibility of any adverse effect existed due to Plan direction or if the Plans did not address lynx conservation issues.

The Federal agencies chose a conservative approach in determining whether Plans might result in adverse effects to lynx. The determination was based only on what the Plans directed or allowed, not on a quantitative assessment of the effects to lynx from actual actions as a result of past or current implementation of the Plans. We acknowledge that many activities allowed by Plans, such as timber harvest and road construction, are never carried out for a variety of reasons, such as funding limitations and environmental, wildlife or policy considerations (U.S. Forest Service and Bureau of Land Management 1999).

The DBA identifies 15 criteria that contribute to some level of adverse effects to either an individual lynx or a population segment through failure to meet any one of the programmatic conservation measures in the LCAS. These criteria included, but are not limited to, precommercial thinning, fire management, landscape patterns, winter recreation, and monitoring. Individually, these criteria may not impart substantial impacts on the DPS, however, current Plans do allow actions that cumulatively could result in significant detrimental effects to the DPS. We cannot predict the future levels of impacts to lynx that would result from continued implementation of current Plans. However, the DBA concludes that there is reasonable potential for adverse effects to lynx as a result of actions directed or allowed by existing Plans. Because the Forest Service and BLM manage a substantial amount of lynx forest types in the contiguous United States, particularly in the West, it is imperative that lynx habitat and habitat for lynx prey be maintained and conserved on Federal lands. Though a large percentage of these lands are in nondevelopmental status, a large proportion remain subject to management under multiple use mandates. Until Plans adequately address risks such as those identified in the LCAS, we conclude that the lack of Plan guidance for conservation of lynx, and the potential for Plans to allow or direct actions that adversely affect lynx (as evidenced by the assessment in the DBA), is a significant threat to the contiguous United States DPS of the lynx. On February 4, 1977, the lynx was included in Appendix II of the CITES. The CITES is an international treaty established to prevent international trade that may be detrimental to the survival of plants and animals. A CITES export permit must be issued by the exporting country before an Appendix II species may be shipped. The CITES permits may not be issued if the export will be detrimental to the survival of the species or if the specimens were not legally acquired; however, CITES does not itself regulate take or domestic trade and therefore does not contribute to protection of the lynx in the United States.

Factor E. Other Natural or Manmade Factors Affecting Its Continued Existence

Based on mapping of lynx forest types for the contiguous United States (McKelvey *et al.* 1999b), we know that the southern boreal forests that support lynx and hares in the contiguous United States are naturally fragmented and disjunct compared with the northern boreal forests in Canada and Alaska (see "Background" section). Connectivity of appropriate habitat types and cover provide travel corridors between habitat patches, thereby increasing the likelihood of successful lynx dispersal. However, we know that lynx can traverse a variety of habitat types and obstacles, including rivers, nonforested habitats, and various types of roads, based on records of lynx occurrences in habitats and locations far from their traditional range and forest habitat types, such as Nebraska, Nevada, Iowa, and South Dakota (Aubry *et al.* 1999; McKelvey *et al.* 1999b; Ruggiero et al. 1999b).

For most areas of the contiguous United States, we have no evidence that human-caused factors have significantly reduced the ability of lynx to disperse or have resulted in the loss of genetic interchange. No information is currently available to identify whether any genetic concerns exist for lynx in the contiguous United States.

In western regions of lynx range, naturally fragmented patches of lynx habitat, typically occurring along mountain ranges, are often connected by a variety of intervening habitats, including shrub steppe, grassland, low-elevation forested or unforested valleys, and in some cases, desert. This natural fragmentation becomes more pronounced in the more southern extremes of lynx range. We have little information to compare these intervening landscapes to the historical condition, nor do we fully understand the environmental or physiological requirements of lynx as they attempt to disperse across them. We do know that much of the intervening landscapes between patches of lynx forest types in the Northern Rockies/Cascades is either used for agriculture or is Federal land; human population centers and other large human developments are limited across the western range of lynx.

In the Northeast, development along the St. Lawrence seaway and ice breaking for winter navigation may reduce the ability of lynx to move between northern Quebec and the area south of the St. Lawrence that includes southern Quebec, New Brunswick, Nova Scotia, and the northeastern United States (R. Lafond, pers. comm. 1999). Historically, lynx populations in the Northeast were periodically supplemented with transient or dispersing individuals from northern Quebec (Litvaitis *et al.* 1991). South of the St. Lawrence, movement is still possible between southeastern Quebec, western New Brunswick, Maine and New Hampshire, because the habitat is contiguous along the Appalachian Mountains and there are no natural or human-caused barriers to dispersal.

In the Great Lakes Region, winter navigation on the St. Mary's River between Ontario and Michigan's Upper Peninsula may reduce the ability of lynx to migrate across the St. Mary's shipping channel from Ontario to Michigan (Robinson and Fuller 1980).

Lynx movements may be negatively influenced by high traffic volume on roads that bisect suitable lynx habitat. In southern British Columbia, lynx movements and selection of home ranges appear to be influenced by highways (Apps 1999). Apps (1999) surmised that highway influence on lynx varies according to local habitat conditions, roadway width, traffic

volume, and possibly gender and reproductive status of individual lynx. Given the distances and locations where known lynx within the southern boreal forest have moved, we know that lynx successfully cross many types of roads, including unpaved forest roads, secondary paved roads, State and interstate highways (Mech 1980; Smith 1984; Brainerd 1985; Aubry *et al.* 1999; Squires and Laurion 1999). We suspect that highways with high volumes of traffic and associated suburban developments inhibit lynx home range movement and dispersal, and may contribute to loss of habitat connectivity. Such highways occur in the Southern Rockies Region connecting cities, towns, and ski areas, and also in the Northern Rockies/Cascade Region through the Cascade Range along the Columbia River. However, no information currently exists to determine the level at which traffic volume or roadway design may influence lynx movements or create an impediment to movement.

Although we assume that high-volume, high-speed traffic presents a barrier to dispersal, roads do not appear to be a significant direct cause of lynx mortality (Staples 1995; Ruggiero *et al.* 1999b). Few records exist of native lynx being killed by vehicles (Wydeven 1998; M. DonCarlos, *in litt.* 1994). None of the animals tracked by radiotelemetry in various studies throughout the contiguous United States were killed in vehicle accidents (Aubry *et al.* 1999). The majority of records of lynx mortalities from vehicle accidents are of recently translocated animals, who generally move large distances before settling (Brocke *et al.* 1991; Brocke *et al.* 1993; G. Byrne, Colorado Division of Wildlife, pers. comm. 1999). The high incidence of translocated lynx killed by cars is likely not typical of resident lynx populations in southern boreal forests (Aubry *et al.* 1999).

At the time of the proposed rule, we thought that the existence, density, and human use of unpaved forest roads also negatively impacted resident lynx populations by causing displacement or avoidance by lynx and degradation of lynx habitat. Evidence now available indicates that lynx tolerate some level of human disturbance (Staples 1995; Aubry *et al.* 1999; Bailey and Staples 1999; Mowat *et al.* 1999). No evidence exists that human presence displaces lynx. Although information regarding indirect effects of roads on lynx populations is lacking, recent analyses on the Okanogan National Forest in Washington indicate that lynx show no preference or avoidance of forest roads, and that road density does not appear to affect lynx habitat selection (McKelvey *et al.* 1999c). Lynx have been documented using some types of roads for hunting and travel (Parker 1981; Koehler and Brittell 1990; Koehler and Aubry 1994). We find no information demonstrating that forest roads negatively impact resident lynx populations.

In the proposed rule, we stated that increasing ease of human access into forests increased the vulnerability of lynx to intentional or unintentional shooting and trapping (Todd 1985; McKay 1991; Washington Department of Wildlife 1993; Koehler and Aubry 1994). We know that lynx are taken during legal trapping and hunting for other species, such as wolverine and bobcat, even when lynx seasons are closed (McKay 1991; Staples 1995; Wydeven 1998; M. DonCarlos *in litt.* 1994; R. Naney, pers. comm. 1999). We do not know how many lynx may be purposefully poached, but are concerned about radio-collared lynx that have been killed but not reported (G. Byrne, pers. comm. 1999; M. Amaral, pers. comm. 1999). No reliable recordkeeping exists to determine how frequently such taking occurs, nor if it has increased because of the increasing accessibility of forests. Further, lynx were likely captured incidentally in the past during regulated and unregulated trapping for other predators, and still they have persisted throughout much of their historic range. We are concerned about the loss of lynx through legal or illegal trapping and shooting; however, we have no information to indicate that the loss of these individuals is negatively affecting the overall ability of the contiguous United States DPS to persist (see "Factor B" of this section).

In the proposed rule, we considered displacement or elimination of lynx when competitors (e.g., bobcat, coyote) expand into lynx range (de Vos and Matel 1952; Parker *et al.* 1983; Quinn and Parker 1987) to be a significant threat to the contiguous United States DPS of lynx. At this time, there are no data on competition between lynx and other species; therefore, we have only information on behavior of possible competitors from which to gain some inferences about the possibility of competition and its impact on lynx.

Coyote, bobcat, and mountain lion are hypothesized to be potential lynx competitors (Brocke 1982; McCord and Cardoza 1982; Parker *et al.* 1983; Quinn and Parker 1987; Aubry *et al.* 1999; Buskirk *et al.* 1999a; Ruggiero *et al.* 1999b). In the Northeast and Great Lakes regions of the contiguous United States range of the lynx, bobcat and coyote ranges generally overlap with lynx. In the Northern Rockies/Cascades and Southern Rockies lynx generally overlap with bobcat, coyote and mountain lion. Lynx are highly evolved for hunting in deep snow: they have a morphological advantage because they are able to walk on snow rather than sink into it as do species with higher foot loads, such as the coyote, bobcat, or mountain lion (Murray and Boutin 1991; Buskirk *et al.* 1999a). Traditionally, where these species' ranges overlap with that of lynx, snow conditions exclude them from the winter habitats occupied by lynx (McCord and Cardoza 1982; Parker *et al.* 1983; Quinn and Parker 1987; Buskirk *et al.* 1999a).

However, today competition may be facilitated through human alteration of forests, creating habitats that may be more suitable to potential lynx competitors (McCord and Cardoza 1982; Quinn and Parker 1987; Buskirk *et al.* 1999a). The range of the coyote has significantly expanded, snowshoe hares are important prey for both coyotes and bobcats, mountain lion numbers appear to have increased, mountain lions have killed lynx, and snowtrails packed by humans facilitate the movement of potential lynx competitors into the deep snow habitats of the lynx.

Researchers believe the coyote's original range prior to European settlement was the North American Great Plains but over the past century its range has substantially expanded in all directions (Nowak 1979; 1999; Parker 1995). Nearly the entire North American range of the lynx now overlaps with that of the coyote. Coyotes expanded into the far western States in the mid to late 1800s, the western Great Lakes states in the early 1900s, and the Northeast by the 1950s (Nowak 1979, 1999; Parker 1995). Coyotes are generalist predators, feeding on rabbits and hares, rodents, deer, and plants (Parker 1995). In northern latitudes, particularly in winter, where the diversity of food items is limited, snowshoe hares are a primary food item for coyotes (Parker 1995; Staples 1995); the concern regarding competition with lynx stems primarily from diet overlap.

Extirpation of the wolf (*Canis lupus*) is one factor believed to have enabled the coyote to extend its range (Parker 1995). As wolf populations expand in the Northern Rockies Region in Montana, Idaho, and Wyoming, and the Great Lakes Region in Minnesota, Wisconsin, and Michigan, we expect coyote populations may be reduced (Crabtree and Sheldon 1999). An indirect result may be a reduction in the potential for coyotes to affect lynx in areas of overlap between lynx and wolves.

The range of the bobcat overlaps the lynx range within the contiguous United States and southern Canada. Like the coyote, the bobcat is a generalist predator that feeds on a wide variety of prey, including snowshoe hares (McCord and Cardoza 1982; Koehler and Hornocker 1991). Although lynx in the southern boreal forests evolved with bobcats, competition between these species is suspected because of their similar size and appearance (Buskirk *et al.* 1999a). Bobcats remain restricted to areas with low snow depths (Koehler and Hornocker 1991; Buskirk *et al.* 1999a). Parker *et al.* (1983) speculated that bobcats displaced lynx from all areas on Cape Breton Island, Nova Scotia, except high elevations, where snow accumulation limited the bobcat's range. We have no evidence that competition with bobcats has negatively affected the contiguous United States DPS.

Buskirk *et al.* (1999a) advanced the theory that mountain lions compete with lynx, based on a few records of mountain lions killing lynx and presumed increasing mountain lion populations. Interactions between lynx and lions would most likely occur during snowfree seasons because lions generally do not occupy the same winter habitats as lynx (H. Quigley, Hornocker Wildlife Institute, pers. comm. 1999). It is generally accepted that mountain lion numbers in the West have increased, therefore the rate of encounters between lynx and mountain lions has probably increased (H. Quigley, pers. comm. 1999). Deer (*Odocoileus* spp.) are the primary prey of mountain lions (Dixon 1982) and are an important food item for coyotes (Parker 1995) and bobcats (McCord and Cardoza 1982; Koehler and Hornocker 1991). In Idaho, mountain lion kills were frequently visited by bobcats and coyotes (Koehler and Hornocker 1991). Lions kill coyotes and bobcats, often in defense of food caches (Boyd and O'Gara 1985; Koehler and Hornocker 1991). Lynx occasionally feed on ungulates or scavenge from carcasses (Brand *et al.* 1976); we expect interactions between mountain lions and lynx would most likely occur in defense of food caches, as with coyotes and bobcats. Despite numerous mountain lion studies within the western range of the lynx, incidents of lions killing lynx are extremely rare (H. Quigley, pers. comm. 1999). No evidence exists that mountain lions exert a population-level impact on lynx.

Historically, interactions between lynx and potential competitors were limited in winter because most competitors cannot effectively move through the deep snow habitats of the lynx (Buskirk *et al.* 1999a). Now, ski and snowmobile trails and roads that are maintained for winter recreation and forest management create packed snow corridors that give other species access to lynx winter habitat (Koehler and Aubry 1994; U.S. Forest Service *et al.* 1999), although significant amounts of habitat remain relatively undisturbed by humans in the interior of large blocks of lynx forest types on Federal lands in the West, especially in designated wilderness and National Parks (U.S. Forest Service and Bureau of Land Management 1999). It appears that bobcats remain restricted to areas with low snow depths (Koehler and Hornock 1991; Buskirk *et al.* 1999a), and that lynx and lion winter habitats typically do not overlap (H. Quigley, pers. comm. 1999).

Coyotes use packed snowtrails and now occupy the winter habitats of lynx (Murray and Boutin 1991; Murray *et al.* 1994; Staples 1995; O'Donoghue *et al.* 1997, 1998a, 1998b) and, therefore, are a concern as a potential lynx competitor in winter. Studies of lynx, coyotes, and hares from the Yukon Territory and Alaska provide some information with which to consider potential for competition between lynx and coyote in winter (Murray and Boutin 1991; Murray *et al.* 1994; Staples 1995; O'Donoghue *et al.* 1997, 1998a, 1998b). Coyotes adapted their behavioral patterns for hunting in snow by selecting snow that was shallower and harder; whereas lynx successfully hunted in all habitats where hares were found (Murray and Boutin 1991; Murray *et al.* 1994; O'Donoghue *et al.* 1998a). Coyotes and lynx both preferred snowshoe hares over alternate prey during all phases of the hare cycle (O'Donoghue *et al.* 1998a). During the snowshoe hare decline, lynx switched to hunting red squirrels, whereas coyotes switched to hunting voles (O'Donoghue *et al.* 1998b). In Alaska, Staples (1995) believes that the 42 percent dietary overlap between lynx and coyote observed during a cyclic low in the hare cycle indicated the potential for competition; however, we are not aware of research or other evidence indicating that coyote competition has negatively affected the lynx populations in Canada. In fact, we expect that the variability of snow conditions and frequency of fresh snows in the winter habitats that support lynx continually reduce or alter the availability of snowtrails and shallow snow depths used by coyotes in lynx habitat, making it more difficult for coyotes to effectively hunt in these areas regularly during the winter. No evidence exists indicating that coyote competition has negatively affected the contiguous United States lynx DPS (Aubry *et al.* 1999).

Little is known about lynx habits in snow-free seasons. A greater diversity of prey and habitats available during this time may reduce the negative effects of competition. Furthermore, because lynx have co-evolved with bobcats and mountain lions, and in most areas lynx have coexisted with coyotes for many decades, we suspect some level of segregation of habitat and prey among these species. In summer in Idaho, coyotes, bobcats, and mountain lions used different topographic and habitat features, allowing habitat and prey resources to be partitioned among these species; coyotes used lower elevations than bobcats who used lower elevations than lions (Koehler and Hornocker 1991). All of the elevations used in this study were within the range recorded for lynx occurrences in the West (McKelvey *et al.* 1999b); however, the data for lynx were not recorded by season. We suspect these data are more representative of elevations lynx use in winter rather than snow-free seasons because much of the lynx data are from trapping records, an activity that occurs during winter.

In summary, we conclude lynx movements may be negatively influenced by high traffic volume on roads that bisect suitable lynx habitat, such as in the Southern Rockies and in some parts of the Northern Rockies/Cascades Region. We suspect that highways with high volumes of traffic and associated suburban developments inhibit dispersal and movements within home ranges, and may contribute to loss of habitat connectivity. However, roads do not appear to be a significant direct cause of lynx mortality. We find no information demonstrating that forest roads negatively impact resident lynx populations. Packed snowtrails facilitate the movement of coyotes into formerly inaccessible deep snow habitats occupied by lynx; however, we have no evidence that competition with coyotes, mountain lions or bobcats is negatively affecting lynx at a population-level scale.

Finding

We conclude that, in the contiguous United States, lynx populations occur at naturally low densities and that the rarity of lynx at the southern portion of their range compared to more northern populations is normal. This rarity is based largely on low densities of snowshoe hares, their primary prey. Low snowshoe hare densities are likely a result of naturally patchy, transitional

boreal habitat at southern latitudes that prevents hare populations from achieving densities similar to those in the extensive northern boreal forest of Canada. Low numbers of lynx reflected in harvest data for the contiguous United States are not a result of overtrapping, but of naturally limiting fragmentation, topography, and climate. Lynx in the contiguous United States are the southernmost extension of a larger metapopulation whose core is in central Canada.

We conclude the single factor threatening the contiguous U.S. DPS of lynx is the inadequacy of existing regulatory mechanisms, specifically the lack of guidance for conservation of lynx in National Forest Land and Resource Plans and BLM Land Use Plans as described in Factor D. Until Plans adequately address risks such as those identified in the LCAS, and described generally in Factors A, B and E, we conclude that the lack of Plan guidance for conservation of lynx, as evidenced by the fact that Plans allow or direct actions that cumulatively adversely affect lynx (as indicated by the assessment in the DBA), is a significant threat to the contiguous U.S. DPS of lynx. Therefore, we find that listing the lynx within the contiguous United States as threatened is necessary.

We conclude that Federal land management assumes the largest single role in the conservation of lynx in the contiguous United States because of the preponderance of lynx forest types on Forest Service, BLM, and National Park Service lands, particularly in the western United States. A substantial amount of lynx forest types occur on Forest Service and BLM lands (Northern Rockies-72 percent, Cascades-99 percent, Southern Rockies-82 percent, Great Lakes-19 percent, Northeast-7 percent). We believe that the large amount of lynx forest types properly managed in nondevelopmental allocations, especially in designated wilderness areas, and amendments to existing land use plans, such that management of lynx forest types in developmental areas does not conflict with lynx conservation, will be a substantial benefit to lynx in the Northern Rockies/Cascades and Southern Rockies and will contribute significantly to the likelihood of conserving lynx into the future within the contiguous United States.

It is imperative that snowshoe hare and alternate prey populations be supported by appropriate habitat management on Federal lands into the future to ensure the conservation of lynx in the contiguous United States. Substantive declines in prey species, especially snowshoe hare, may result in a prey base insufficient to support lynx persistence.

Factors affecting lynx status vary among regions of the contiguous United States. The Northern Rockies/Cascades Region supports the largest amount of lynx habitat and has the strongest evidence of resident lynx populations, both historically and currently. This region has strong habitat connections to lynx populations in Canada, as well as large proportions of lynx habitat in wilderness and other areas with limited human influence. The Northern Rockies/Cascades Region has the highest potential to maintain a viable lynx population within the contiguous United States. Available evidence suggests that lynx populations within this region fluctuate, and we have no information suggesting a declining population trend. The primary factor affecting lynx in this region is the inadequacy of existing regulatory mechanisms, specifically the lack of guidance for conservation of lynx in Federal land management plans.

In the Southern Rockies Region, lynx habitat is naturally limited and highly fragmented, which leads us to conclude that lynx were rare historically. We conclude native lynx may now be extirpated from this region. The factors affecting lynx in this region are the inadequacy of existing regulatory mechanisms, specifically the lack of guidance for conservation of lynx in Federal land management plans, and loss of habitat connectivity resulting from high-use highways and associated suburban development.

The historic and current status of lynx in the Great Lakes Region is uncertain. We lack information to determine whether lynx in this region are simply dispersing from Canada, are members of a resident population, or are a combination of a resident population and dispersing individuals. Much of this region contains marginal habitat that may not sustain resident lynx populations. The factors affecting lynx in this region include the inadequacy of existing regulatory mechanisms, specifically the lack of guidance for conservation of lynx in Federal land management plans, and timber harvest and fire suppression on non-Federal lands.

In the Northeast, lynx reproduction and individual animals have recently been documented in Maine. Recent lynx harvests were substantial in adjacent southeastern Quebec. Therefore, we conclude that a resident population of lynx continues to exist in the core of the region; however, the range may have retracted northward. The main factor affecting lynx forest types in this region is timber harvest on non-Federal lands, although the extent of influence of current forest practices on lynx is not known.

Within the contiguous United States, the relative importance of each region to the persistence of the DPS varies. The Northern Rockies/Cascades Region supports the largest amount of lynx habitat and has the strongest evidence of persistent occurrence of resident lynx populations, both historically and currently. In the Northeast (where resident lynx populations continue to persist) and Southern Rockies regions, the amount of lynx habitat is naturally limited and does not contribute substantially to the persistence of the contiguous United States DPS. Much of the habitat in the Great Lakes Region is naturally marginal and may not support prey densities sufficient to sustain lynx populations. As such, the Great Lakes Region does not contribute substantially to the persistence of the contiguous United States DPS. Collectively, the Northeast, Great Lakes, and Southern Rockies do not constitute a significant portion of the range of the DPS. We conclude the Northern Rockies/Cascades Region is the primary region necessary to support the continued long-term existence of the contiguous United States DPS. However, the role that each region plays in the long-term conservation of the species will be explored further in recovery planning for the species.

Critical Habitat

Critical habitat is defined in section 3(5)(a) of the Act as—(i) the specific areas within the geographical area occupied by a species, at the time it is listed in accordance with the Act, on which are found those physical or biological features (I) essential to the conservation of the species and (II) that may require special management considerations or protection and; (ii) specific areas outside the geographical area occupied by a species at the time it is listed, upon a determination that such areas are essential for the conservation of the species. The term "conservation" as defined in section 3(3) of the Act means "to use and the use of all methods and procedures necessary to bring any endangered or threatened species to the point at which the measures provided pursuant to this Act are no longer necessary," that is, the species is recovered and can be removed from the list of endangered and threatened species.

Section 4(a)(3) of the Act, as amended, and implementing regulations (50 CFR 424.12) require that, to the

maximum extent prudent and determinable, the Secretary designate critical habitat at the time the species is determined to be endangered or threatened. Our regulations (50 CFR 424.12(a)) state that critical habitat is not determinable if information sufficient to perform required analysis of impacts of the designation is lacking or if the biological needs of the species are not sufficiently well known to permit identification of an area as critical habitat. Section 4(b)(2) of the Act requires us to consider economic and other relevant impacts of designating a particular area as critical habitat on the basis of the best scientific data available. The Secretary may exclude any area from critical habitat if he determines that the benefits of such exclusion outweigh the conservation benefits, unless to do so would result in the extinction of the species.

In the proposed rule, we indicated that designation of critical habitat was not prudent for the Canada lynx because it could increase the vulnerability of lynx to poaching, because the species and its habitat are continually shifting spatially and temporally across the landscape making static designation of specific areas of little benefit to the species, and because designation of broad geographic areas would necessarily include many areas of unsuitable habitat that would not be used by and would not be critical to the species. We also indicated that designation of critical habitat was not prudent because we believed it would not provide any additional benefit beyond that provided through listing as threatened.

In the last few years, a series of court decisions have overturned Service determinations regarding a variety of species that designation of critical habitat would not be prudent. Based on the standards applied in those judicial opinions, we have reexamined the question of whether critical habitat for Canada lynx would be prudent.

The primary regulatory effect of critical habitat is the section 7 requirement that Federal agencies refrain from taking any action that destroys or adversely modifies critical habitat. While a critical habitat designation for habitat currently occupied by this species would not be likely to change the section 7 consultation outcome because an action that destroys or adversely modifies such critical habitat also would be likely to adversely affect the species, there may be instances where section 7 consultation would be triggered only if critical habitat is designated. Examples could include unoccupied habitat or occupied habitat that may become unoccupied in the future. There also may be some educational or informational benefits to designating critical habitat. Therefore, we find that critical habitat is prudent for Canada lynx.

As explained in detail in our Final Listing Priority Guidance for Fiscal Year 2000 (64 FR 57114), our listing budget is currently insufficient to allow us to immediately complete all of the listing actions required by the Act. Deferral of the critical habitat designation for Canada lynx allows us to concentrate our limited resources on higher priority critical habitat (including court ordered designations) and other listing actions, while allowing us to put in place protections needed for the conservation of Canada lynx without further delay. However, because we have successfully reduced, although not eliminated, the backlog of other listing actions, we anticipate in FY 2000 and beyond giving higher priority to critical habitat designation, including designations deferred pursuant to the Listing Priority Guidance, such as the designation for this species, than we have in recent fiscal years.

We plan to employ a priority system for deciding which outstanding critical habitat designations should be addressed first. We will focus our efforts on those designations that will provide the most conservation benefit, taking into consideration the efficacy of critical habitat designation in addressing the threats to the species, and the magnitude and immediacy of those threats. We will develop a proposal to designate critical habitat for the Canada lynx as soon as feasible, considering our workload priorities. Unfortunately, for the immediate future, most of Region 6's listing budget must be directed to complying with court orders and settlement agreements, as well as due and overdue final listing determinations.

Available Conservation Measures

Conservation measures provided to species listed as endangered or threatened under the Act include recognition, recovery actions, requirements for Federal protection, and prohibitions against certain practices. Recognition through listing results in public awareness and conservation actions by Federal, State, and local agencies, private organizations, and individuals. The Act provides for possible land acquisition and cooperation with the States and requires that recovery actions be carried out for all listed species. The protection required of Federal agencies and the prohibitions against taking and harm are discussed, in part, below.

Section 7(a) of the Act requires Federal agencies to evaluate their actions with respect to any species that is proposed or listed as endangered or threatened and with respect to its critical habitat, if any is being designated. Regulations implementing this interagency cooperation provision of the Act are codified at 50 CFR part 402. Section 7(a)(4) requires Federal agencies to confer with the Service on any action that is likely to jeopardize the continued existence of a species proposed for listing or result in destruction or adverse modification of proposed critical habitat. If a species is listed subsequently, section 7(a)(2) requires Federal agencies to ensure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of the species or destroy or adversely modify its critical habitat. If a Federal action may affect a listed species or its critical habitat, the responsible Federal agency must enter into formal consultation with us.

The Forest Service and the Fish and Wildlife Service recently signed a Lynx Conservation Agreement (Feb 2000) to promote the conservation of lynx and lynx habitat on Federal lands managed by the Forest Service. It identifies actions the signatories agree to take to reduce or eliminate adverse affects or risks to lynx and lynx habitat. Implementation of these actions within this agreement will provide immediate benefits to lynx.

Section 9 of the Act and implementing regulations set forth a series of general prohibitions and exceptions that apply to all endangered or threatened wildlife. The prohibitions, codified at 50 CFR 17.21 and 17.31, in part, make it illegal for any person subject to the jurisdiction of the United States to take (includes harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt any of these), import or export, ship in interstate commerce in the course of commercial activity, or sell or offer for sale in interstate or foreign commerce any listed species. It also is illegal to possess, sell, deliver, carry, transport, or ship any such wildlife that has been taken illegally. Certain exceptions apply to agents of the Service and State conservation agencies.

Permits may be issued to carry out otherwise prohibited activities involving endangered or threatened wildlife under certain circumstances. Regulations governing permits are codified at 50 CFR 17.22, 17.23, and 17.32. Such permits are available for scientific purposes, to enhance the

propagation or survival of the species, and/or for incidental take in the course of otherwise lawful activities. For threatened species, permits also are available for zoological exhibition, educational purposes, or special purposes consistent with the purposes of the Act.

It is our policy, as published in the **Federal Register** on July 1, 1994, to identify to the maximum extent practicable at the time a species is listed those activities that would or would not constitute a violation of section 9 of the Act (59 FR 34272). The intent of this policy is to increase public awareness of the effect of this listing on proposed and ongoing activities within the species' range. For the contiguous United States population of wild lynx, we believe the following actions would not likely result in a violation of section 9 of the Act:

(1) Actions that may result in take of wild lynx in the contiguous United States that are authorized, funded, or carried out by a Federal agency when the action is conducted in accordance with an incidental take statement issued by us pursuant to section 7 of the Act;

(2) Actions that may result in take of wild lynx in the contiguous United States when the action is conducted in accordance with a permit issued under 50 CFR 17.32 or special rule issued under section 4(d) of the Act. These activities include take for educational purposes, scientific purposes, the enhancement of propagation or survival, zoological exhibition, and other conservation purposes consistent with the Act.

For the contiguous United States population of captive lynx, we believe the following actions would not likely result in a violation of section 9 of the Act:

(1) Take, transport, possess, sell, deliver, and receive of captive lynx and export of captive lynx or their pelts under valid CITES export permits.

For the contiguous United States population of wild lynx, the following actions likely would be considered a violation of section 9 of the Act:

(1) Take of wild lynx (including both purposeful and incidental)

(2) Possessing, selling, delivering, carrying, transporting, or shipping illegally taken lynx;

(3) Export of lynx or lynx parts or products (including pelts) without a permit under section 17.32 (a CITES permit would also be required in order to be in compliance with CITES);

(4) Significant lynx habitat modification or degradation to the point that it results in death or injury by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering.

For the contiguous United States population of captive lynx, the following would likely constitute a violation of section 9 of the Act:

(1) export of any lynx part or products other than a properly tagged pelt or permitted parts or products;

For lynx that occur outside of the contiguous United States (Alaska and Canada), the Endangered Species Act listing and companion 4(d) have no effect. Lynx in those areas, as well as in the contiguous United States, remain covered by the designation of Appendix II under CITES. Therefore, the import of lynx into the United States and the transportation of lynx from Alaska to the contiguous United States may continue under current procedures established by State law and CITES.

Requests for copies of the regulations regarding listed wildlife and inquiries about prohibitions and permits may be addressed to United States Fish and Wildlife Service, P.O. Box 25486, Denver Federal Center, Denver, Colorado 80225.

Special Rule

Section 4(d) also states that the Service may, by regulation, extend to threatened species, prohibitions provided for endangered species under section 9. Our implementing regulations for threatened wildlife (50 CFR 17.31) incorporate the section 9 prohibitions for endangered wildlife, except when a special rule is promulgated pursuant to section 4(d) applies (50 CFR 17.31(c)).

This special rule applies the general take prohibitions for threatened wildlife to the wild population of Canada lynx in the contiguous United States. It also provides for the continuation of the take and export of captive lynx and their pelts under Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) export permits and provides for the transportation of lynx pelts in commerce within the United States. The export of properly tagged (with valid CITES export tag) pelts from lynx documented as captive is not prohibited under the special rule. Properly tagged pelts may be transported in interstate trade without permits otherwise required under 50 CFR 17.32.

CITES is an international treaty for the regulation of international trade in certain animal and plant species. The lynx was included in CITES Appendix II on February 4, 1977, as a part of the listing of all Felidae that were not already included in the appendices. A CITES export permit pursuant to 50 CFR part 23 must be issued by the exporting country before an Appendix II species may be shipped. All Felidae are included in Appendix II to enable better protection of look-alike species that were or could be threatened with extinction without strict regulation of trade. After the lynx (as well as the bobcat and river otter) were included in CITES Appendix II, we worked with the States to develop guidelines for State programs that would provide the information needed to satisfy CITES export requirements. Under the State CITES export programs, all pelts to be exported are required to be tagged with a permanently attached, serially numbered tag that identifies the species, State of origin, and season of taking. The tags are provided to the States and Tribes by the Service. In the past the States that have been approved for export of captive or wild lynx are Alaska, Idaho, Minnesota, Montana, and Washington. In the last few years Idaho, Minnesota and Washington have had zero quotas or closed seasons, and Montana has had a quota of two to three wild lynx trapped per year. Due to the listing all of the States in the contiguous U.S. will no longer be approved for export of wild lynx; Lynx in Alaska are not encompassed by this listing; all existing CITES requirements remain the same for lynx originating in Alaska.

Currently facilities in Idaho, Minnesota, Montana, North Dakota, and Utah raise captive lynx for commercial purposes. At least some of the farms report that their initial stock was obtained from Canada. From 1992 through 1997, Minnesota and Montana reported that a total of 169 lynx pelts were tagged for export under the CITES program and these primarily originated from farmed animals. These captive-bred specimens have neither a positive nor negative effect on the species in the wild.

Current prices for lynx pelts are low so there is little present incentive to trap wild lynx. However, an increase in pelt prices could create a strong incentive to trap wild lynx and export their pelts. Lynx are easy to trap, and the illegal take of lynx would present an enforcement and inspection problem for Service personnel. Since they look the same, captive lynx pelts cannot be effectively differentiated from wild lynx pelts by Service law enforcement and inspection personnel without proper tagging.

This final rule would allow the export from the United States of live captive lynx or their pelts if the pelt is tagged with a CITES export tag and accompanied by a valid CITES export permit. The import of lawfully obtained live lynx or their parts or products

would continue to require the necessary CITES export permits from the exporting country, but no additional permits under 50 CFR 17.32 would be required. CITES permit requirements are found in 50 CFR part 23.

In summary, CITES permits will be required for the export of captive lynx or their parts or products from the United States. No permits under 50 CFR 17.32 will be required for the importation of lynx or their parts or products into the United States or for interstate commerce in pelts that are properly tagged with valid CITES export tags. However, interstate commerce of untagged pelts is prohibited.

Similarity of Appearance

In the proposed rule we proposed listing the wild population of lynx in the contiguous United States as threatened, and we proposed listing the captive population separately under the similarity of appearance provisions of the Act (section 4(e)). We proposed listing the captive population under the Similarity of Appearance provisions in order to aid law enforcement efforts to protect the wild populations. Upon further review we have determined that separate listings of the wild and captive populations are not necessary. Instead, we have revised the special 4(d) rule accompanying this listing rule to establish prohibitions for the wild and captive populations separately.

Paperwork Reduction Act for the Listing Rule

This rule does not contain any new collections of information other than those already approved under the Paperwork Reduction Act, 44 U.S.C. 3501 *et seq.*, and assigned Office of Management and Budget clearance number 1018–0094. An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information, unless it displays a currently valid control number. For additional information concerning permit and associated requirements for threatened wildlife, see 50 CFR 17.32.

Required Determinations for the Listing and Special Rule

In accordance with Executive Order 12866, this document is a significant rule and has been reviewed by the Office of Management and Budget, under Executive Order 12866. We completed a Record of Compliance for the 4(d) rule, and published a notice of availability for the Record of Compliance in the **Federal Register** on July 26, 1999 (64 FR 40333). A copy can be obtained by contacting the Montana Field Office (see ADDRESSES section).

National Environmental Policy Act

We have determined that Environmental Assessments and Environmental Impact Statements, as defined in the National Environmental Policy Act of 1969, need not be prepared in connection with regulations adopted pursuant to section 4(a) of the Act. A notice outlining our reasons for this determination was published in the **Federal Register** on October 25, 1983 (48 FR 49244).

References Cited

A complete list of all references cited herein, as well as others, is available upon request from the Montana Field Office (see ADDRESSES section).

Author(s)

The primary authors of this document are Lori Nordstrom and Anne Vandehey, Montana Field Office, Helena, Montana; and Janet Mizzi, Mountain-Prairie Regional Office, Denver, Colorado.

List of Subjects in 50 CFR Part 17

Endangered and threatened species, Exports, Imports, Reporting and recordkeeping requirements, Transportation.

Regulation Promulgation

Accordingly, we amend part 17, subchapter B of chapter I, title 50 of the U.S. Code of Federal Regulations, as set forth below:

PART 17—[AMENDED]

1. The authority citation for part 17 continues to read as follows:

Authority: 16 U.S.C. 1361–1407; 16 U.S.C. 1531–1544; 16 U.S.C. 4201–4245; Pub. L. 99–625, Stat. 3500; unless otherwise noted.

2. Section 17.11(h) is amended by adding the following, in alphabetical order under "MAMMALS," to the List of Endangered and Threatened Wildlife:

§ 17.11 Endangered and threatened wildlife.

* * * * *

(h) * * *

Species		Historic range	Vertebrate population where endangered or threatened	Status	When listed	Critical habitat	Special rules
Common name	Scientific name						
MAMMALS							
*	*	*	* *		*		*
Lynx, Canada	*Lynx canadensis*	U.S.A. (AK, CO, ID, ME, MI, MN, MT, NH, NY, OR, UT, VT, WA, WI, WY) Canada.	CO, ID, ME, MI, MN, MT, NH, NY, OR, UT, VT, WA, WI, WY.	T	692	NA	17.40 (k)
*	*	*	* *		*		*

3. Section 17.40 is amended by adding paragraph (k) to read as follows:

§ 17.40 Special rules—mammals

* * * * *

(k) Canada lynx (*Lynx canadensis*).

(1) *What lynx does this special rule apply to?* The regulations in this paragraph (k) apply to all wild and captive lynx in the contiguous United States.

(2) *What activities are prohibited for wild lynx?* All prohibitions and provisions of 50 CFR 17.31 and 17.32 apply to wild lynx found in the contiguous United States.

(3) *What is considered a captive lynx?*

(i) For purposes of this paragraph (k), captive lynx means lynx, whether alive or dead, and any part or product, if the specimen was in captivity at the time of the listing, born in captivity, or lawfully imported or transported into the contiguous United States.

(ii) Lynx that were either born or held in captivity and then released into the wild are considered wild.

(4) *What activities are allowed for captive lynx?*

(i) *Take.* You may take lawfully obtained captive lynx without a permit.

(ii) *Import and export.* You may export captive live lynx, parts or products of captive lynx provided the

specimens are tagged with Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) export tags and/or accompanied by a valid CITES export permit. You may import lawfully obtained lynx that originated outside the United States when you follow the requirements of CITES.

(iii) *Interstate commerce.* You may deliver, receive, carry, transport, ship, sell, offer to sell, purchase, or offer to purchase in interstate commerce captive lynx and captive lynx parts and products in accordance with State or tribal laws and regulations. In addition, lynx pelts that are properly tagged with valid CITES export tags also qualify for this exemption on interstate commerce.

(5) *Are any activities not allowed or restricted for captive lynx?* You must comply with all applicable State and tribal laws and regulations. Violation of State or tribal law will also be a violation of the Act.

Dated: March 16, 2000.

Jamie Rappaport Clark,

Director, Fish and Wildlife Service.

[FR Doc. 00–7145 Filed 3–21–00; 8:45 am]

BILLING CODE 4310–55–p

Appendix P – Notice of Remanded Determination of Status for the Contiguous United States Distinct Population Segment of the Canada Lynx; Clarification of Findings; Final Rule

Federal Register

Thursday,
July 3, 2003

Part III

Department of the Interior

Fish and Wildlife Service

50 CFR Part 17

Endangered and Threatened Wildlife and Plants; Notice of Remanded Determination of Status for the Contiguous United States Distinct Population Segment of the Canada Lynx; Clarification of Findings; Final Rule

DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

RIN 1018–AF03

Endangered and Threatened Wildlife and Plants; Notice of Remanded Determination of Status for the Contiguous United States Distinct Population Segment of the Canada Lynx

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Clarification of findings.

SUMMARY: The Fish and Wildlife Service (Service), in response to the December 26, 2002, memorandum opinion and order of the United States District Court for the District of Columbia, in the case of *Defenders of Wildlife* v. *Norton* (Civil Action No. 00–2996 (GK)) and pursuant to the Endangered Species Act of 1973, as amended (ESA or Act), provides a clarification to the findings we made in support of the final rule that listed Canada lynx (*Lynx canadensis*) (lynx) as threatened. The lynx is currently listed as threatened in the contiguous United States as a Distinct Population Segment (DPS) that includes the States of Colorado, Idaho, Maine, Michigan, Minnesota, Montana, New Hampshire, New York, Oregon, Utah, Vermont, Washington, Wisconsin, and Wyoming. As a result of our reanalysis of the basis for that final rule, which was directed by the Court, we find that the lynx is not endangered throughout a significant portion of its range. This finding does not affect the status of the lynx as currently set forth in 50 CFR 17.11; the lynx continues to be listed as threatened in the States listed above. This finding also does not affect the special rule pursuant to section 4(d) of the Act for the Canada lynx set forth in 50 CFR 17.40(k).

ADDRESSES: The complete file for this rule is available for inspection, by appointment, during normal business hours at the Montana Field Office, U.S. Fish and Wildlife Service, 100 N. Park Avenue, Suite 320, Helena, Montana 59601.

FOR FURTHER INFORMATION CONTACT: Mark Wilson, Field Supervisor, Montana Field Office (see **ADDRESSES**), telephone 406–449–5225; facsimile 406–449–5339.

SUPPLEMENTARY INFORMATION:

Background

The Service listed the Canada lynx, hereafter referred to as lynx, as threatened on March 24, 2000 (65 FR 16052). After listing the lynx as threatened, plaintiffs in the case of *Defenders of Wildlife* v. *Norton* (Civil Action No. 00–2996 (GK)) initiated action in Federal District Court, challenging the listing of the lynx as threatened and alleging violations of the Act and the Administrative Procedure Act (5 U.S.C. 551 *et seq.*). Plaintiffs argued that the Service acted arbitrarily and capriciously when it (1) did not treat the four lynx regions as separate DPSs, (2) determined that the lack of guidance for conservation of lynx in National Forest Land and Resource Management Plans and Bureau of Land Management (BLM) Resource Area Management Plans is the single factor threatening the contiguous United States DPS of lynx, (3) did not designate critical habitat for the lynx, and (4) determined that "[c]ollectively, the Northeast, Great Lakes and Southern Rockies do not constitute a significant portion of the range of the DPS."

On December 26, 2002, the Court issued its memorandum opinion and order, deciding that the Service's determination that "[c]ollectively, the Northeast, Great Lakes and Southern Rockies do not constitute a significant portion of the range of the DPS" must be set aside and remanded to the Service for further consideration of the lynx's status under the ESA consistent with the Court's memorandum opinion. The Court explained that the Service's determination about the four regions was counterintuitive and contrary to the plain meaning of the ESA phrase "significant portion of its range." The Court did not address the issues concerning the threats and the DPSs. The Court also ordered the Service to "undertake prompt rulemaking" in order to designate critical habitat for lynx, and ordered injunctive relief directed at section 7 consultation.

The Court ordered the determination concerning a "significant portion of its range" be remanded to the Service and completed within 180 days of the date of the order consistent with the Court's memorandum opinion. With this document, the Service is providing its consideration of this issue. This document does not address critical habitat for the lynx, since our listing budget is currently insufficient to begin work on a rule for critical habitat. The Service will seek public comment in the future when it proposes critical habitat. This document also does not address the special rule for Canada lynx established in the March 24, 2000, final listing rule. That rule, which is found in 50 CFR 17.40(k), remains in effect.

As noted above, plaintiffs contend that our determination that "[c]ollectively, the Northeast, Great Lakes, and Southern Rockies do not constitute a significant portion of the range of the DPS," was critical to our decision not to list the lynx as endangered. Plaintiffs maintain that, if those three regions are considered collectively to be a significant portion of the DPS, "then the Lynx's highly imperilled status in those three areas would necessitate listing of the entire DPS as endangered." Pls. Mot. for Summ. J. at 30 (emphasis in original). However, the Service would need to find that the lynx is endangered in these areas and that they were significant in order to list the entire DPS. Therefore, we first reviewed all of the threats to the lynx in these areas to determine whether it is in danger of extinction in each area. We identified two areas or parts of areas in which the lynx might be in danger of extinction. We then determined whether either of those areas (or parts of areas) constitutes a significant portion of the range of the lynx.

The remainder of this section describes some important concepts used throughout the following analysis. Later sections include background information on the natural history and range of the lynx, responses to public comments, an analysis of the quantity and quality of habitat throughout the range of the DPS, an analysis of the threats facing the species in the areas addressed by the remand, a finding as to the areas in which the lynx currently are in danger of extirpation, and a finding that those areas do not constitute a significant portion of the range of the lynx.

As a preliminary matter, we note that the Court suggested, but did not decide, that "significant" is appropriately defined in this context as "a noticeably or measurably large amount," citing a dictionary definition. However, there are other definitions of significance that pertain to importance. Moreover, we believe this is more consistent with the intent of the Act in the context of the provision at issue. Otherwise, a severe threat to a small area within the range of a species would always require the species to be listed as endangered, no matter how inconsequential that area might be given the biology of the species. For example, building a large dam may make the area covered by the resulting artificial lake unsuitable for an aquatic species currently resident in the river to be dammed. The area covered by the lake would be a "measurably large" area, and therefore a measurably large portion of the range of the species.

However, if the species is sufficiently widespread and healthy, the area subject to the threat would not be biologically important, and we believe it was not the intent of Congress that all such circumstances lead to the listing of all affected species.

Understanding "significant" to mean "important," the following analysis concentrates on applying our understanding of the ecology of the lynx to the geography of its habitat. This allows us to determine whether a given area is a significant portion of the range of lynx.

With the help of new information available as a result of ongoing research, we continue to improve our understanding of lynx ecology in the contiguous United States. In delineating the range of the lynx in the contiguous United States, we must take into account lynx life history requirements, population dynamics, and the natural features of the vegetation communities that make up lynx habitat. The following list summarizes fundamental elements that determine the range of the lynx in the contiguous United States. We describe these elements in further detail later in this notice.

(1) Lynx in the contiguous United States are at the southern margins of a widely-distributed lynx population whose center is in north-central Canada and Alaska. Lynx populations in the contiguous United States are sustained by cyclic influx from lynx populations in Canada.

(2) Lynx are specialized predators of snowshoe hare (*Lepus americanus*). Lynx populations track hare cycles. Abundant hares are necessary to support survival of lynx kittens and recruitment into and maintenance of the lynx population. As a result, depending on habitat quality, local lynx populations naturally may not be able to survive through a cyclic low in the hare cycle.

(3) Lynx and snowshoe hare habitat is boreal forest where there are cold winters with deep snow.

(4) In the contiguous United States, the boreal forest is at its southernmost extent, transitions into other vegetation communities, and is naturally patchy. These natural patches may not be big enough or of high enough quality to support a resident lynx population.

(5) The habitat within these patches changes over time and location, naturally becoming suitable or unsuitable for lynx with forest succession or changes in local climate conditions.

(6) Lynx disperse long distances when hare populations decline. As a result, they can colonize suitable but unoccupied habitats, augment existing resident populations, or disperse to habitats where they cannot survive.

As a result of the factors described above, the range of the lynx in the contiguous United States is comprised of areas supporting resident, breeding populations and areas supporting occasional dispersers:

(1) Resident population—Resident, breeding populations exist in areas of abundant, higher-quality habitat. These areas are "core" areas essential to maintaining lynx in the contiguous United States. During cyclic population lows, resident lynx populations are naturally reduced to extremely low numbers of individuals. Throughout this document, we use the term "resident population" to refer to a group of lynx that has exhibited long-term persistence in an area as determined by a variety of factors, such as evidence of reproduction, successful recruitment into the breeding cohort, and maintenance of home ranges.

(2) Dispersers—Lynx records in many parts of the contiguous United States are of dispersing animals. Lynx occur as dispersers where boreal forest is isolated, patchy, or of marginal quality such that it cannot sustain a resident, breeding lynx population. We include areas of the contiguous United States that contain boreal forest as potential lynx range. Although dispersing lynx may periodically occupy some of this range, there is a low probability that habitat quality and quantity are sufficient to support a breeding population. It is possible that some of the large outlying patches of boreal forest may periodically support some breeding lynx; however, evidence of this is minimal and our best information indicates that these areas are likely to contribute little to the persistence of the species in the contiguous United States.

Some dispersing lynx are found in completely unsuitable habitats, such as prairie or deciduous forest, where they are unable to survive in the long term. We do not include such areas within the range of lynx because such occurrences are unpredictable and because, to the best of our knowledge, such areas have not contained conditions capable of supporting lynx since at least the time of European settlement.

We use the word "dispersers" to refer to lynx that have left the area they originally occupied for various reasons, most often when snowshoe hare populations decline. To successfully disperse, lynx must find suitable habitat and a mate and must successfully reproduce (McKelvey *et al.* 2000a). Successful dispersals can result in the colonization of unoccupied habitats and contribute to the persistence of the metapopulation (as described in the next paragraph). Unsuccessful dispersal is a natural phenomenon that occurs when lynx move to habitats that are unable to sustain lynx. These individuals are unable to survive and are lost from the metapopulation. Unsuccessful dispersal is demonstrated by records of lynx in areas such as North Dakota, Nebraska, and Iowa, which cannot support lynx populations in the long term (Adams 1963; Gunderson 1978; W. Jobman, U.S. Fish and Wildlife Service, in litt. 1997).

Another word we use is "metapopulation." According to McKelvey *et al.* (2000a), a metapopulation is a number of discrete subpopulations within habitat patches, connected by dispersal. Through time, subpopulations may go extinct (no longer existing or living) and be recolonized, but the larger metapopulation persists. We believe lynx in the contiguous United States are part of a larger metapopulation with lynx populations in Canada.

The range of the lynx must be considered differently from the range of other species that are less mobile and have more stable population dynamics. Because the lynx is highly mobile and has cyclic population dynamics that are tied to its primary prey, the snowshoe hare, numbers of lynx naturally fluctuate and become extremely low at times during a cycle. Additionally, where snowshoe hare populations are not adequate, resident lynx populations cannot be sustained. Because of this, resident lynx populations never occurred everywhere boreal forest existed in the contiguous United States. Where the boreal forest was naturally more patchy and marginal the habitat was incapable of supporting an adequate snowshoe hare population that in turn was able to support a resident lynx population over time. As a result, only a few areas in the contiguous United States historically supported adequate quantity and quality of habitat to support resident lynx populations over time. Many historical lynx occurrences across a large area of the contiguous United States were likely dispersers. The occurrence of dispersing lynx is unpredictable, and dispersing lynx will continue to periodically move into areas that are not lynx habitat. This historic, natural condition continues to exist today, as will be discussed in this document.

Natural History

In the following section we describe in more detail than we did in the final rule the natural history, population

dynamics, and habitat of lynx in the contiguous United States, information necessary to delineate lynx range. The lynx is a medium-sized cat with long legs; large, well-furred paws; long tufts on the ears; and a short, black-tipped tail (McCord and Cardoza 1982). The lynx's long legs and large feet make it highly adapted for hunting in deep snow.

Lynx are highly specialized predators of snowshoe hare. The North American distribution of the lynx is nearly the same as that of the snowshoe hare, both of which are strongly associated with boreal forest (Bittner and Rongstad 1982; McCord and Cardoza 1982; Quinn and Parker 1987; Agee 2000; Aubry *et al.* 2000; McKelvey *et al.* 2000b). Boreal forests are cold and moist with conifer trees, the predominant type of trees being species of spruce and fir (Elliot-Fisk 1988). Lynx habitat can be generally described as boreal forests that have cold winters with deep snow and that provide a snowshoe hare prey base (Quinn and Parker 1987, McKelvey *et al.* 2000b, Mowat *et al.* 2000). For example, in the Northeast, lynx were most likely to occur in areas with greater than 268 centimeters (cm) (105 inches (in)) of annual snowfall (Hoving 2001). Boreal forests are naturally dynamic and, therefore, are known as "disturbance forests" (Elliot-Fisk 1988, Agee 2000). The landscape changes over time and location as the forest undergoes natural succession following natural or human-caused disturbances such as fire, insect epidemics, wind, ice, disease, and logging. Large-scale disturbance is necessary to create the mosaic of different successional forest stages that provide suitable foraging and denning habitat for lynx. Lynx in the contiguous United States are at the southern margins of a widely distributed lynx population that is most abundant in northern Canada and Alaska.

To understand habitat relationships of lynx one must first understand the habitat relationships of snowshoe hares, their primary prey. Snowshoe hares use spruce and fir forests with dense understories that provide forage, cover to escape from predators, and protection during extreme weather (Wolfe *et al.* 1982; Monthey 1986; Hodges 2000a, 2000b). Generally, earlier successional (younger) forest stages have greater understory structure than do mature forests and, therefore, support higher hare densities (Fuller 1999, Hodges 2000a, 2000b). Lynx generally concentrate their hunting activities in areas where hare populations are high (Koehler *et al.* 1979; Parker 1981; Ward and Krebs 1985; Major 1989; Murray *et al.* 1994; O'Donoghue *et al.* 1997, 1998a). In Maine, snowshoe hare abundance and lynx occurrence are positively associated with late regeneration forests (forest stands that are growing back 12 to 30 years after being clear-cut and have greater than 50 percent canopy closure), evidence that lynx are selecting habitat primarily on the abundance of primary prey (Hoving 2001).

Lynx numbers and snowshoe hare densities in the contiguous United States generally do not get as high as in the center of their range in Canada, and there is no evidence they ever did so in the past (Hodges 2000a, 2000b; McKelvey *et al.* 2000b). It appears that northern and southern hare populations have similar cyclic dynamics but that in southern areas both peak and low densities are lower than in the north (Hodges 2000b). However, it is unclear whether hare populations cycle everywhere in the contiguous United States. Relatively low snowshoe hare densities at southern latitudes are likely a result of the naturally patchy, transitional boreal habitat at southern latitudes that prevents hare populations from achieving densities similar to those of the expansive northern boreal forest (Wolff 1980; Buehler and Keith 1982; Koehler 1990; Koehler and Aubry 1994). Additionally, the presence of more predators and competitors of hares at southern latitudes may inhibit the potential for high-density hare populations with extreme cyclic fluctuations (Wolff 1980). As a result of naturally lower snowshoe hare densities, lynx densities at the southern part of the range rarely achieve the high densities that occur in the northern boreal forest (Aubry *et al.* 2000).

The association between lynx and snowshoe hare is considered a classic predator-prey relationship (Saunders 1963; van Zyll de Jong 1966; Quinn and Parker 1987, Krebs *et al.* 2001). In northern Canada and Alaska, lynx populations fluctuate on approximately 10-year cycles that follow the cycles of hare populations (Elton and Nicholson 1942; Hodges 2000a, 2000b; McKelvey *et al.* 2000b). Generally, researchers believe that when hare populations are at their cyclic high, the interaction of predation and food supply causes hare populations to decline drastically (Buehler and Keith 1982; Krebs *et al.* 1995; O'Donoghue *et al.* 1997, Krebs *et al.* 2001). There is little evidence of regular snowshoe hare cycles in the Northeast and southern Quebec (Hoving 2001), but hare populations do fluctuate widely in this region. Hare fluctuations in this region may be more influenced by forest practices, weather, and other ecological factors. Snowshoe hare provide the quality prey necessary to support high-density lynx populations (Brand and Keith 1979). Lynx also prey opportunistically on other small mammals and birds, particularly when hare populations decline (Nellis *et al.* 1972; Brand *et al.* 1976; McCord and Cardoza 1982; O'Donoghue *et al.* 1997, 1998a). Red squirrels (*Tamiasciurus hudsonicus*) are an important alternate prey (O'Donoghue *et al.* 1997; 1998a; Apps 2000; Aubry *et al.* 2000). However, a shift to alternate food sources may not sufficiently compensate for the decrease in hares consumed to be adequate for lynx reproduction and kitten survival (Brand and Keith 1979, Koehler 1990, Koehler and Aubry 1994). When snowshoe hare densities decline, the lower quality diet causes sudden decreases in the productivity of adult female lynx and decreased survival of kittens, if any are born during this time; as a result, recruitment of young into the population nearly ceases during cyclic lows of snowshoe hare populations (Nellis *et al.* 1972; Brand *et al.* 1976; Brand and Keith 1979; Poole 1994; Slough and Mowat 1996; O'Donoghue *et al.* 1997, Mowat *et al.* 2000).

Lynx den sites are found where coarse woody debris, such as downed logs and windfalls, provides denning sites with security and thermal cover for lynx kittens (McCord and Cardoza 1982; Koehler 1990; Koehler and Brittell 1990; Slough 1999; Squires and Laurion 2000; J. Organ, U.S. Fish and Wildlife Service, in litt. 1999). The integral component for all lynx den sites appears to be the amount of downed, woody debris present, not the age of the forest stand (Mowat *et al.* 2000). In Maine, 17 den sites have been located in a variety of stand types, including 10- to 20-year-old clear-cut and adjacent residual stands (J. Organ, U.S. Fish and Wildlife Service, in litt. 1999; G. Matula, Maine Department Inland Fisheries and Wildlife in litt. 2003). Maine den sites are characterized by regenerating hardwoods and softwoods, dense understory, and abundant coarse woody debris (J. Organ, in litt. 1999, 2003). In Washington, lynx denned in lodgepole pine (*Pinus contorta*), spruce (*Picea* spp.), and subalpine fir (*Abies lasiocarpa*) forests older than 200 years with an abundance of downed woody debris (Koehler 1990). A den site in Wyoming was located in a mature subalpine fir/lodgepole pine forest with abundant downed logs and dense understory (Squires and Laurion 2000).

Lynx require very large areas containing boreal forest habitat. In the Northeast, lynx were most likely to occur in areas containing suitable

habitat that were greater than 100 square kilometers (km^2) (40 square miles (mi^2)) (Hoving 2001). The requirement for large areas also is demonstrated by home ranges that encompass many square miles. The size of lynx home ranges varies by the animal's gender and age, abundance of prey, season, and the density of lynx populations (Hatler 1988; Koehler 1990; Poole 1994; Slough and Mowat 1996; Aubry *et al.* 2000; Mowat *et al.* 2000). Based on a limited number of studies in southern boreal forest, the average home range for males is 151 km^2 (58 mi^2), for females it is 72 km^2 (28 mi^2) (Aubry *et al.* 2000). Recent home range estimates from Maine are 70 km^2 (27 mi^2) for males and 52 km^2 (20 mi^2) for females (G. Matula, in litt. 2003). However, documented home ranges in both the southern and northern boreal forest vary widely from 8 to 800 km^2 (3 to 300 mi^2) (Saunders 1963; Brand *et al.* 1976; Mech 1980; Parker *et al.* 1983; Koehler and Aubry 1994; Apps 2000; Mowat *et al.* 2000; Squires and Laurion 2000; Squires *et al.* 2001; G. Matula, in litt. 2003). Generally, it is believed that larger home ranges, such as have been documented in some areas in the southern extent of the species' range in the West, are a response to lower-density snowshoe hare populations (Koehler and Aubry 1994; Apps 2000; Squires and Laurion 2000).

Lynx are highly mobile and have a propensity to disperse. Long-distance movements (greater than 100 kilometers (km) (60 miles (mi))) are characteristic (Mowat *et al.* 2000). Lynx disperse primarily when snowshoe hare populations decline (Ward and Krebs 1985; Koehler and Aubry 1994; O'Donoghue *et al.* 1997; Poole 1997). Subadult lynx also disperse even when prey is abundant (Poole 1997), presumably as an innate response to establish home ranges. Lynx also make exploratory movements outside their home ranges (Squires *et al.* 2001). Lynx are capable of moving extremely long distances (greater than 500 km (300 mi)) (Mech 1977; Brainerd 1985; Washington Department of Wildlife 1993; Poole 1997; Mowat *et al.* 2000; Squires *et al.* 2001); for example, a male was documented traveling 620 km (380 mi) (Brainerd 1985). A male lynx in Wyoming made an exploratory movement of 730 km (450 mi) round trip from its home range (Squires *et al.* 2001). While it is assumed lynx would prefer to travel where there is forested cover, the literature contains many examples of lynx crossing large, unforested openings (Roe *et al.* 2000). The ability of both male and female lynx to disperse long distances, crossing unsuitable habitats, indicates they are capable of colonizing suitable habitats and finding potential mates in areas that are isolated from source lynx populations.

Range of Lynx in the Contiguous United States

Within the contiguous United States, the lynx's range coincides with that of the southern margins of the boreal forest along the Appalachian Mountains in the Northeast, the western Great Lakes and the Rocky Mountains and Cascade Mountains in the West. In these areas, the boreal forest is at its southern limits, becoming naturally fragmented into patches of varying size as it transitions into subalpine forest in the West and deciduous temperate forest in the east (Agee 2000, Wisconsin Department Natural Resources, in litt. 2003). Because the boreal forest transitions into other forest types to the south, scientists have difficulty mapping its exact boundaries (Elliot-Fisk 1988). Therefore, precisely identifying and describing the distribution of lynx habitat also is difficult because there are several vegetation and landform classifications and descriptions that have been published for various parts of North America (U.S. Forest Service and Bureau of Land Management 1999). However, the term "boreal forest" broadly encompasses most of the vegetative descriptions of this transitional forest type that makes up lynx habitat in the contiguous U.S. (Agee 2000).

In addition to appropriate vegetation type, delineation of the range of the lynx within the contiguous United States must consider snow conditions. Lynx are at a competitive advantage over other carnivores (*e.g.*, bobcats (*Lynx rufus*) or coyotes (*Canis latrans*)) in areas that have cold winters with deep snow because of the lynx's morphological adaptations for hunting and surviving in such environments. Therefore, lynx populations may not be able to successfully compete and persist in areas with insufficient snow even if suitable forest conditions otherwise appear to be present (Ruediger *et al.* 2000; Ruggiero *et al.* 2000b; Hoving 2001; S. Hassett, Wisconsin Department Natural Resources, in litt. 2003). A consistent winter presence of bobcats indicates such areas are not of high quality for lynx.

Lynx in the contiguous United States are part of a larger metapopulation whose center is located in the northern boreal forest of central Canada; lynx populations emanate from this area (Buskirk *et al.* 2000b; McKelvey 2000a, 2000b). It appears hare populations and, as a result, lynx populations in the southern part of the range are cyclic, although the amplitude of the fluctuations in this portion of the range is not as extreme as in the center of the range (Aubry *et al.* 2000; Hodges 2000a, 2000b; Malloy 2000; McKelvey 2000b). When there is a high in the lynx population in central Canada, it acts like a wave radiating out to the margins of the lynx range (McKelvey *et al.* 2000a, 2000b). We know from historic data that the magnitude of the lynx population high emanating from the central Canadian boreal forest varies for each cycle (McKelvey *et al.* 2000a, 2000b). This wave can be produced by local populations reacting to environmental conditions, dispersers, or a combination of these (McKelvey *et al.* 2000b). Schwartz *et al.* (2002) concluded this wave is driven by dispersers, based on findings of a high level of gene flow between lynx in Alaska, Canada, and the western United States.

Lynx populations in the northeastern United States and southeastern Canada are separated from those in north-central Canada by the St. Lawrence River. There is little evidence of regular hare or lynx population cycles in this area (Hoving 2001), but wide fluctuations in lynx and snowshoe hare populations do occur. On a smaller scale, fluctuating populations in the core of this area (Quebec's Gaspé Peninsula, western New Brunswick, and northern Maine) can potentially influence lynx distribution up to several hundred miles distant.

We believe lynx dispersing during periods of population highs will occupy many patches of boreal habitat at the periphery of their range. Some patches will be suitable to maintain a long-term population and some will not. Where the boreal forest habitat patches within the contiguous United States are large, with suitable habitat, prey, and snow conditions, resident populations of lynx are able to survive throughout the low period of the approximately 10-year cycle. Most likely the influx of lynx from populations in Canada at the high point of the cycle augments these resident populations. It is likely that some of these habitat patches within the contiguous United States are able to act as sources of lynx (where recruitment is greater than mortality) that are able to disperse and potentially colonize other patches (McKelvey *et al.* 2000a).

In other areas, the lynx that remain in an area after a cyclic population high may be so few or in naturally marginal habitat that they are not able to persist or establish local populations, although some reproduction may occur. Such

areas naturally act as "sinks," where lynx mortality is greater than recruitment and lynx are lost from the overall population (McKelvey *et al.* 2000a). Sink habitats are most likely those places on the periphery of the southern boreal forest where habitat naturally becomes more patchy and more distant from larger lynx populations. We consider lynx found in these sink habitats to be dispersers but we include these areas within the range of the lynx. Changes in the habitat conditions or cyclic fluctuations in the prey populations may cause some habitat patches to change from being sinks to sources and vice versa. Through this natural process, local lynx populations in the contiguous United States may "blink" in and out as the metapopulation goes through the 10-year cycle. We conclude that where habitat is of high enough quality and quantity, resident lynx populations are able to become established or existing populations are augmented, aiding in their long-term persistence.

We include areas that contain boreal forest but that support only dispersers within the range of the lynx because of the possibility lynx could establish a small, local population and contribute to the persistence of the metapopulation. However, evidence of this is minimal.

An example of the cyclic population "wave" occurred in the 1960s and 1970s, when numerous lynx were reported in the contiguous United States far from source lynx populations. These records of dispersing lynx correlate to unprecedented cyclic lynx highs in Canada (Adams 1963; Harger 1965; Mech 1973; Gunderson 1978; Thiel 1987; McKelvey *et al.* 2000b; Mowat *et al.* 2000). These dispersers frequently were documented in areas such as Wisconsin, that are close to source populations of lynx in Canada or possibly northeastern Minnesota and that contain some boreal forest. But there also have been a number of occurrences of dispersers in unsuitable habitats far from source populations, such as North Dakota prairie (Adams 1963; Gunderson 1978; Thiel 1987; McKelvey *et al.* 2000b; Verts and Carraway 2001).

Rather than recognizing that the cyclic peaks of the early 1960s and 1970s were anomalous highs for the 20th century, as explained in the final rule, some wildlife managers expected subsequent cycles to be equally high. Managers became concerned when harvest returns in the 1980s and 1990s indicated comparatively low cycles. However, as thoroughly described in the final rule, lynx harvest returns in the 1980s and early 1990s were not unusual nor appreciably lower than those recorded prior to the 1960s.

Some maps (*e.g.*, Hall and Kelson 1959, Tanimoto and Garton 1993) incorrectly portray the range of the lynx by encompassing peripheral records from areas that are not within boreal forest or do not have cold winters with deep snow, such as prairie or deciduous forest. Such maps have led to a misperception that the historic range of the lynx in the contiguous United States was once much more extensive than ecologically possible. Records of lynx outside of southern boreal forest in peripheral habitats that are unable to support lynx represent long-distance dispersers that are lost from the metapopulation unless they return to boreal forest and contribute to the persistence of a population. These unpredictable and temporary occurrences are not included within either the historic or current range of lynx because they are well outside of lynx habitat. This includes records from Connecticut, Indiana, Iowa, Massachusetts, Nebraska, Nevada, North Dakota, Ohio, Pennsylvania, South Dakota, and Virginia (Hall and Kelson 1959; Burt 1954 in Brocke 1982; Gunderson 1978; McKelvey *et al.* 2000b; J. Belfonti, The Nature Conservancy, in litt. 1994; S. Johnson, Indiana Department of Natural Resources, in litt. 1994; P. Jones, Ohio Department of Natural Resources, in litt. 1994; South Dakota Natural Heritage Program, in litt. 1994; W. Jobman, U.S. Fish and Wildlife Service, in litt. 1997; Smithsonian Institute, in litt. 1998). In the proposed rule to list the lynx, we included Massachusetts and Pennsylvania in the historic range of the lynx but removed those areas from the range in the final rule because of better information that historically habitat in these States was not capable of supporting lynx. We consider both the historic and current range to consist of Colorado, Idaho, Maine, Michigan, Minnesota, Montana, New Hampshire, New York, Oregon, Utah, Vermont, Washington, Wisconsin, and Wyoming because these States support some boreal forest and have more frequent records of lynx.

Previous Federal Action

The final rule that listed lynx as threatened in the contiguous United States described the history of the Service's actions concerning the listing of the lynx. That discussion is incorporated herein by reference. Since publication of the final rule and as a result of the litigation that requires us to reconsider our determination about the significant portion of the range of lynx, we reopened the comment period for 30 days to acquire information to assist us during our reconsideration (March 17, 2003, 68 FR 12611). This comment period closed on April 16, 2003.

Summary of Comments and Recommendations

As a result of the reopened comment period in March and April 2003, the Service received 118 comments and recommendations. Of these comments, 2 were from Congressional or Legislative officials, 6 were from Federal agencies; 6 from States; 2 from County Commissioners, 17 from environmental organizations, 3 from businesses, 9 from Industry Trade Associations, 1 from a University, and 70 from individuals. Some commenters provided information relevant to our determination regarding the significant portion of the range of lynx. Comments of a similar nature are grouped into general issues. These issues and our responses are discussed below.

We received numerous comments covering a broad spectrum of lynx-related issues that are not the subject of this notice or are beyond the scope of the court's remand. We are not addressing these comments in this document. These comments covered such subjects as: designation of critical habitat for lynx; the existence of various DPSs of lynx; general support for or opposition to protection of lynx under the Act; support for or opposition to lynx re-introduction efforts; classifying the lynx re-introduction in the Southern Rocky Mountains as an experimental, non-essential population; concern that the Service was prioritizing the listing and protection of charismatic mega-fauna ahead of other flora and fauna; the competency and intent of the Service; an internet retail vendor of lynx pelts; recovery planning; and streamlining section 7 consultations. In particular, we received a number of comments as to the status of the lynx throughout the U.S. DPS (*i.e.*, endangered, threatened, or neither). However, the only portion of our March 24, 2000 final listing determination that the court remanded for further consideration was our determination that "[c]ollectively, the Northeast, Great Lakes and Southern Rockies do not constitute a significant portion of the range of the DPS." Our finding on this limited remand is discussed below. To the extent that the information we received since the final listing determination, or that we receive in the future, causes us to reevaluate the listing of the lynx, we will issue an appropriate proposed rule when resources allow.

We conducted peer review of the proposed rule to list the contiguous United States population of lynx during the open public comment period in 1998. For this court-ordered reanalysis of the 2000 final rule listing the lynx, we did not have time to conduct additional peer review.

Issue 1: Technical information was provided based on recent research on lynx and snowshoe hares in Maine and Montana. Additional technical information on lynx populations and lynx habitat quality and quantity was provided by the State of Maine, the State of Vermont, the State of Colorado, the State of Wisconsin, the State of Wyoming, the State of Minnesota, research by the University of Maine and the University of Montana, the U.S. Forest Service, the BLM, the National Park Service, a number of environmental and industry groups, and individuals.

Response: We incorporated this information into this document.

Issue 2: Several commenters expressed support or concern for the Service's determination considering the significant portion of the range of the lynx. Specifically, commenters explained their concerns about whether or not the Northeast, Great Lakes, or the Southern Rockies constitute a significant portion of the range of the lynx.

Response: The Act defines "endangered species" as any species which is in danger of extinction throughout all or a significant portion of its range. A "threatened species" is any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. The District Court found our determination that the Northeast, Great Lakes, and the Southern Rockies do not constitute a significant portion of the range of the lynx was arbitrary and capricious, and as a result of that finding, directed us to reevaluate it. Based on our reanalysis, we have determined that lynx is not in danger of extinction throughout a significant portion of its range in the contiguous United States DPS.

Issue 3: Several commenters opposed combining the Cascades in general, or specific locations within Washington, with the Northern Rocky Mountain region for our analysis.

Response: We combine the Cascades with the Northern Rocky Mountain region for our analysis and for convenience only because the issues in both regions are similar and frequently the best information available addressed both regions. The two areas are separated by the Okanogan River valley in northern Washington, which lynx can cross, although we believe most movement of lynx to be north-south within contiguous habitat with Canada and less likely that lynx would move between habitat patches within Washington. Furthermore, the Cascades alone supports the smallest amount of lynx habitat of any region within the contiguous United States. The relative size and close proximity of the lynx habitat in the Cascades to that in the Northern Rocky Mountains further supports considering both areas as one. Combining these two regions has not in any way diminished or obscured our analysis of the status of lynx or the threats to the species.

Issue 4: Several commenters suggested the Cascades, the Cascades/Northern Rocky Mountains, the Southern Rockies, the Great Lakes, and the Northeast Lynx populations should each be designated as individual DPSs. Other commenters believed the contiguous United States as a whole does not fulfill the criteria to be a DPS for lynx.

Response: Reevaluation of DPS issues is outside of the scope of the remand in this case. However, because the plaintiffs' claims regarding application of the Service's authority to list DPSs have not yet been addressed by the court, we are responding to these comments to update and elaborate on our analysis in the final rule. The Act gives us the authority to list fish, wildlife and plants by species, subspecies, or by DPS of any species of vertebrate fish or wildlife which interbreeds when mature. However, Congress directed that we use our authority to list by DPS sparingly (see Senate Report 151, 96th Congress, 1st Session). The Service and National Marine Fisheries Service DPS policy (61 FR 4721) identifies criteria that must be met for a vertebrate group to qualify as a DPS, but it does not require that we designate a DPS in all cases where a vertebrate group meets the DPS criteria. The Service lists, reclassifies, or delists at the level we believe to be most appropriate to carry out the conservation provisions of the Act.

In this document we reaffirm our determination in the final rule to list the lynx in the contiguous United States as a single DPS. There has been no new information since the final rule was published in 2000 that compels us to change our original determination. Subsequent to issuing the proposal to list the lynx in 1998, we evaluated whether any of the four regions individually fulfilled the criteria to be listed as a DPS. As described in the final rule, we recognize that within the contiguous United States the lynx occurs in four regions—the Northeast, Great Lakes, Southern Rocky Mountains, and Northern Rocky Mountains/Cascades. As described elsewhere in this document, we combine the Northern Rocky Mountains and Cascades in our analysis because the two regions are only separated by the Okanogan River valley, which lynx can cross, and forest types and land ownership are similar. Furthermore, the Cascades alone support the least amount of lynx habitat of any region in the contiguous United States. In evaluating whether a region qualified as a separate DPS, we analyzed whether lynx in each region were both discrete and significant, as required by our DPS policy. We concluded that within the contiguous United States these regions are geographically isolated from each other and, therefore, are discrete. Since the final rule, we are less certain that the Southern Rocky Mountains regions were historically as isolated as described by some authors. We believe it is likely that lynx in the Southern Rocky Mountains region may have been dispersers that arrived during extremely high population cycles, as indicated by the fact that the last verified record of lynx in the region is from 1973, which correlates to an extreme cyclic population high documented throughout the contiguous United States and in Canada. As a result, our original conclusion that the Southern Rocky Mountains supported an isolated resident lynx population may not be correct, and the region should perhaps be considered connected to the Northern Rocky Mountains/Cascades region.

When evaluating the status of a potential DPS, the DPS policy requires that we evaluate the significance of the population segment in relation to the taxon. A taxon is the taxonomic group of animals to which the population belongs—in this case the species *Lynx canadensis*. The DPS policy identifies elements that may be considered in determining the discrete population segment's importance to the taxon to which it belongs. These include: (1) Persistence of the discrete population segment in an ecological setting unusual or unique for the taxon, (2) evidence that loss of the discrete population segment would result in a significant gap in the range of a taxon, (3) evidence that the discrete population segment represents the only surviving natural occurrence of a taxon, and (4) evidence that the discrete population segment differs markedly from other populations

of the species in its genetic characteristics.

Lynx canadensis has an extensive distribution in North America, existing in the boreal forest from Alaska throughout Canada from the Yukon and Northwest Territories south across the United States border and east to the Maritime Provinces and the Island of Newfoundland. Of the entire North American range of the lynx, only a small portion extends into the contiguous United States. Individually, the Northeast, Great Lakes, Southern Rocky Mountains, and Northern Rocky Mountains/Cascades account for an extremely small fraction of the entire range of the taxon, the loss of which would not result in a significant gap in the range of the taxon. Within all four regions of the contiguous United States the distribution of lynx is associated with the southern extensions of the boreal forest, where the predominant vegetation in each region is spruce and fir types, although the individual species of vegetation varies. As is true throughout the range of *Lynx canadensis,* within these boreal forests in each region within the contiguous United States, the important element for lynx is forest structure that provides food and cover for snowshoe hares. Lynx cannot sustain breeding populations without an adequate snowshoe hare population. Additionally, the forest must provide cover for lynx dens. Such habitat conditions occur in each of the four regions. As a result, we determined that none of the regions individually constitute significantly unique or unusual ecological settings. The only genetic analysis of lynx populations shows that there is a high level of gene flow between lynx populations in Alaska, western Canada and the western contiguous United States (Schwartz *et al.* 2002). Genetic analysis comparing lynx populations within the contiguous United States has not been done. Finally, lynx in the different regions of the contiguous United States clearly are not the only surviving natural occurrence of lynx. Therefore, the individual regions do not fulfill the significance criteria under our DPS policy and, as a result, do not constitute separate DPSs. The DPS policy allows us to use the international boundary with Canada to delineate a discrete DPS in the contiguous United States. As described in the final rule, lynx in the contiguous United States may be considered ecologically significant because lynx habitat in the contiguous United States is a transitional type of southern boreal forest rather than the classic boreal forest of northern latitudes in Canada and Alaska, which is the center of lynx range. Within this transitional boreal forest within the contiguous United States there are core areas in Maine, Minnesota, Montana, Washington and likely Idaho that support resident, breeding lynx populations, the loss of which would result in a significant gap in the range of lynx. Therefore, we once again conclude the listable entity is the contiguous United States DPS of the lynx, consisting of the Northeast, Great Lakes, Southern Rocky Mountains, and Northern Rocky Mountains/Cascades.

Issue 5: Several commenters raised concerns about threats that were beyond the control of Federal land management practices, particularly in the Northeast where much of the forested lynx habitat is primarily in private ownership.

Response: We recognize that lynx habitat occurs on non-Federal lands, particularly in the Northeast. We do not have specific information on the amount of lynx habitat on non-Federal lands nor precise information on the type of activities that occur on such lands. Non-Federal landowners are under no obligation to identify lynx habitat on their lands nor do they have to supply any information to the Service regarding these lands. We solicited information about non-Federal lands during the reopened comment period. To the extent possible, we attempted to better understand and assess the activities on non-Federal lands that could affect lynx. Our analysis is described in the "Summary of Factors Affecting the Species" section.

Issue 6: Several other comments noted the reduced threat on Federal lands, particularly National Forest lands, resulting from lynx habitat management plans.

Response: We agree that threats to lynx as a result of a lack of Federal land management plan guidance to conserve lynx, as identified in the final rule, have been somewhat alleviated. As described in "Factor D," Conservation Agreements the U.S. Forest Service and BLM have with the Service, and the biological opinion on National Forest and BLM land management plans committed the U.S. Forest Service and BLM to use the Lynx Conservation Assessment and Strategy (LCAS) in determining the effects of actions on lynx. The U.S. Forest Service further committed to deferring any actions that both would adversely affect lynx and do not involve third parties until such time as the Forest Plans are amended to adequately conserve lynx. The ongoing adherence to the Conservation Agreements and programmatic biological opinion and use of the LCAS in assessing the impacts of Federal actions has been effective in removing most threats to the species on these Federal lands. However, amendment or revision of National Forest and BLM land management plans to conserve lynx is still the strongest mechanism needed to ensure lynx and lynx habitat are conserved on National Forest and BLM lands for the long term (see Factor D).

Issue 7: Several commenters suggested that habitat features (such as snow depth, forest composition, prey abundance, elevation, connectivity with lynx populations in Canada) that vary among regions and affect habitat quality may not exist in peripheral areas. Other commenters suggested that generalizations about western lynx populations cannot be applied to the East. Other commenters made recommendations as to how lynx habitat should or should not be defined according to certain vegetation types or descriptions.

Response: Our understanding of lynx habitat requirements is continually refined with ongoing research. We have a better understanding of the habitat conditions based on information from areas where there have been numerous records of lynx over many years and, especially, where resident, breeding populations of lynx have existed over time. Based on the best available information, the key to the presence of lynx populations is adequate snowshoe hare populations. Therefore, habitat conditions and vegetation types that support adequate densities and distribution of snowshoe hares and deep snows are what we consider to be lynx habitat. In general, lynx and snowshoe hare habitats are described as moist boreal forest types that receive deep snow and cold winters (Bittner and Rongstad 1982; McCord and Cardoza 1982; Quinn and Parker 1987; Elliot-Fisk 1988; Agee 2000; Aubry *et al.* 2000; McKelvey *et al.* 2000b; Ruediger *et al.* 2000). It is well established that lynx are highly mobile and are frequently found in marginal forest types or completely unsuitable habitats that cannot sustain lynx. The fact that individual lynx have been found in such areas does not mean that those areas can support a lynx population or should be considered or managed as "lynx habitat" (J. Claar *et al.*, in litt. 2001). To be considered lynx habitat, an area must have the potential to sustain a lynx population over a period of time, which includes supporting the appropriate vegetation composition and structure to support adequate snowshoe hare densities and deep snow where lynx are at a competitive advantage. We recognize

that the specific vegetation composition of the boreal forest type varies among the regions. Additionally, we recognize that boreal forest types on the periphery of the boreal forest range are found in smaller patches and are only marginally able to support adequate snowshoe hare populations. We conclude records of lynx in these marginal areas or in other areas without lynx habitat are of dispersers. Although there is no evidence that such habitats are able to sustain a resident lynx population, we include all areas with lynx occurrences and lynx habitat, however marginal, within the range of lynx.

Issue 8: One comment suggested lynx historically inhabited the Black Hills of South Dakota as a permanent resident. Another comment suggested northern mountain ranges in New Mexico should be included within the range of lynx.

Response: The scientific literature definitively demonstrates that lynx are specialist predators of snowshoe hares and do not successfully reproduce without an adequate diet of snowshoe hares (Brand and Keith 1979). Snowshoe hares are not indigenous to South Dakota (American Society of Mammalogists Web site). Therefore, we conclude South Dakota naturally could not support a lynx population. We recognize that dispersing lynx have occurred in unsuitable habitats such as in South Dakota; however, we do not include areas of unsuitable habitat within the range of lynx. We do not include New Mexico within the range of lynx because we have no reliable records of native lynx occurring in New Mexico. Lynx are not included on the list of Mammals of New Mexico (American Society of Mammalogists Web site). We do not consider lynx recently released into Colorado that strayed into New Mexico as sufficient reason to include New Mexico within the range of native lynx because there is no evidence habitat in New Mexico historically supported lynx.

Issue 9: A number of comments reported lynx sightings or lynx tracks in New York, New Hampshire, Washington, and Wyoming.

Response: Because lynx are difficult to identify and are often confused with bobcats, we must consider the majority of these reports anecdotal. Nonetheless, because of the existence of reliable lynx records from these States, in addition to the presence of lynx habitat, we include all these States within the range of lynx.

Issue 10: Some comments voiced concern that evidence of lynx in some areas was a result of a survey that was subsequently found to have been contaminated.

Response: In this reanalysis of the basis for our final rule, we did not use any information from that particular survey, the results of which have been rescinded by the author because of the contamination of samples. The majority of the evidence of lynx in the contiguous United States is from trapping records, research, and sightings or track surveys by qualified individuals. Results of positive identification of lynx by DNA acquired during the National Lynx Survey (K. McKelvey, Rocky Mountain Research Station, in litt. 2003) provide additional evidence of lynx. The integrity of the National Lynx Survey has been maintained because of the survey method, DNA analyses, and measures used to ensure quality and reliability.

Issue 11: We received a number of comments suggesting that certain land use activities, particularly timber management practices, adversely impact lynx habitat and are incompatible with lynx survival. Alternatively, one comment suggested that pre-commercial thinning can be compatible with objectives for high-quality lynx habitat.

Response: Timber harvesting can be beneficial, benign, or detrimental to lynx depending on harvest methods, spatial and temporal specifications, and the inherent vegetation potential of the site. Forest practices in lynx habitat that result in or retain a dense understory provide good snowshoe hare habitat that in turn provides good foraging habitat for lynx. In Maine, extensive clear cutting over the past 25 years has resulted in a large amount of the forest currently in a stage of regeneration that is optimal for snowshoe hares and lynx. However, research in Maine has shown that snowshoe hare densities are low in forest stands that have been partially harvested such that there is little understory to provide snowshoe hare habitat. The effects of forest practices on lynx are described and analyzed under Factor A.

Issue 12: Several comments raised concerns about the impacts of various activities on lynx habitat. Activities identified by commenters include roads and trails; agricultural and urban development; off-road-vehicle and snowmobile use; ski resort expansion; mining; fire suppression; and grazing.

Response: We address the potential threats to lynx under the "Summary of Factors Affecting the Species" section. As a result of our analysis, we found the threat to lynx by some of these activities, such as fire suppression, is low. We found no evidence that some activities, such as forest roads, pose a threat to lynx. Some of the activities suggested, such as mining and grazing, were not specifically addressed because we have no information to indicate they pose threats to lynx.

In considering threats to lynx, one must consider that lynx have evolved to adapt to an ever-changing boreal forest and require a mosaic within the boreal forest of appropriate species composition, varying stand ages, and structure to support abundant snowshoe hares and lynx denning habitat. Additionally, one must consider scale. Lynx are highly mobile, moving long distances to find abundant prey, and use a large area on a landscape as demonstrated by the large size of an average lynx home range. To significantly impact a local lynx population, an activity would likely have to occur across a very large area (presumably at least the size of several home ranges), create a homogeneous forest that does not provide the various stand ages, species composition, and structure that are good snowshoe hare and lynx habitat, or result in a barrier that effectively precludes dispersal (see Summary of Factors Affecting the Species section).

Issue 13: One comment suggested that climate change posed a threat to southern lynx populations.

Response: This comment is based on a model that predicted that if average annual snow depths decrease for a long period of time in the Northeast, appropriate lynx habitat would be diminished and could be completely eliminated if appropriate climate conditions did not return, as the author theorized could happen as a result of global warming (Hoving 2001). We conclude the potential for long-term reductions in snow depth because of climate change is speculative at this time and is not a threat to lynx within the foreseeable future (see Factor E).

Issue 14: One comment suggested a State-sanctioned coyote snaring program threatens the lynx population in Maine.

Response: As addressed under Factor D, we recognize that legal trapping, snaring, and hunting for bobcat, coyote, wolverine, and other furbearers create a potential for incidental capture or shooting of lynx. We acknowledge that no reliable recordkeeping exists to determine how frequently such take occurs. Mortality of captured individuals likely has differing impacts on the ability of local populations to persist, depending on the size of the local population and when the take occurs in the population cycle. Lynx still persist throughout their range despite the fact that incidental catch occurred historically, in all likelihood at higher levels than presently occur. Although we are concerned about the

mortality of lynx that are incidentally captured, we have no information to indicate that the loss of these individuals negatively affects the overall ability of lynx populations to persist.

Introduction to Remand Analysis

In the final rule, we found that "[c]ollectively, the Northeast, Great Lakes and Southern Rockies do not constitute a significant portion of the range of the DPS." The following reanalysis of that finding is based on the administrative record, information obtained by the Service during the comment period opened to address the issues on remand, and the Court's opinion in the litigation. As discussed above, we address first whether there were any areas in the range of the lynx outside of the Northern Rockies in which the lynx is in danger of extirpation. Our analysis of whether extirpation will occur is based on the five factors listed in section 4(a)(1) of the Act. For any such areas, we then determine whether they constitute a significant portion of the range of the lynx, based largely on the quantity and quality of the habitat in the portion of the range in question.

Summary of Factors Affecting the Species

Section 4 of the Act and regulations (50 CFR part 424) promulgated to implement the listing provisions of the Act set forth the procedures for adding species to the Federal lists. A species may be determined to be an endangered or threatened species due to one or more of the five factors described in section 4(a)(1). These factors and their application to the Canada lynx (*Lynx canadensis*) were discussed in the final rule. Highlighted below are the key points raised in the final rule and the conclusions we made about whether certain activities or conditions threaten Canada lynx to the extent that those points are relevant to the three areas at issue in this remand. If new information changes a statement or conclusion made in the final rule, this point will be made in this analysis. Also discussed below is any new information we received about the five listing factors and their application to lynx during the reopened comment period initiated as a result of the remanded decision. Finally, in this document, we assess the magnitude of the threats to lynx to assist us in determining the status of the species in the areas at issue.

In considering threats to lynx and whether those threats are low, medium, or high, one must consider that lynx have evolved to adapt to an ever-changing boreal forest and require a mosaic within the boreal forest of appropriate species composition, varying stand ages, and structure to support abundant snowshoe hares and lynx denning habitat. Additionally, one must consider scale. Lynx are naturally highly mobile, moving long distances to find abundant prey, and use a large area on a landscape; the average home range for a male lynx is 151 km^2 (58 mi^2) (Aubry *et al.* 2000). In order to affect the suitability of lynx habitat and, in particular, a local lynx population to the extent of putting the population at risk of extinction, an activity would likely have to occur across a very large area (at a minimum the size of several home ranges) and (1) cumulatively result in the conversion of lynx habitat into non-lynx habitat, (2) result in a homogeneous forest that does not provide the various stand ages, species composition, and structure that are good snowshoe hare and lynx habitat, or (3) effectively preclude dispersal.

Factor A. The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range

Habitat Quantity and Quality

In assessing habitat quality for lynx, we examine a variety of elements, such as primary prey (snowshoe hare) abundance, forest type, forest structure, snow conditions, denning habitat, inherent habitat patchiness, and connectivity with larger lynx populations and habitat in Canada. We use lynx reproduction and recruitment into the population as additional indicators of habitat quality.

In the following discussions, we describe available information on lynx occurrence, habitat quantity, habitat quality, and other elements that frame our understanding of lynx in the contiguous United States. The complexities of lynx population dynamics and our incomplete understanding of the limited lynx occurrence data, combined with a naturally dynamic and transitional habitat, make it difficult to precisely delineate the historic or current extent of the range of lynx in the contiguous United States. While recognizing these limitations, we use our best professional judgement of the best scientific and commercial data available to make conclusions about the range of the lynx for the purposes of this remand.

Important to understanding the range of lynx in the contiguous United States is the status of the lynx in any given area as a member of a resident, breeding population or as a disperser. While we recognize and agree with McKelvey *et al.*'s (2000b) caution that lynx occurrence data are too incomplete to infer much beyond simple occurrence, for the purposes of this reevaluation, we feel it necessary to make conclusions about the condition of lynx using our professional assessment of the best scientific and commercial data available. We partially base our conclusions regarding whether lynx in a particular area are resident or dispersers on the record of reliable reports of lynx. We discuss the reliability of records below.

Historic lynx data in the contiguous United States are scarce and exist primarily in the form of trapping records. Many States did not differentiate between bobcats and lynx in trapping records. Therefore, long-term lynx trapping data are not available for most States. Long-term trapping data have been used to understand population trends for various species; however, because trapper effort can change across years, trapping returns may not accurately reflect population trends. Data showing few lynx trapped may be the result of low pelt prices or reduced trapper effort, not necessarily a decreased population. However, despite these difficulties, trapping data are the best information available on historic lynx presence throughout much of its range in the contiguous United States.

In the past, surveys designed specifically for lynx were rarely conducted, and many reports (*e.g.*, visual observations, snow tracks) of lynx were collected incidental to other activities. The reliability of many of these records is unknown. Trapping records may have errors, track identification is extremely difficult, and observations may be wrong because lynx look very similar to bobcat. Data from recent research in Maine and Montana (Hoving 2001; Squires and Ruggiero 2001; Squires *et al.* 2001; Squires *et al.* 2002; Homyack 2003; Maine Department of Inland Fisheries and Wildlife 2003; G. Matula, in litt. 2003; L.S. Mills and P. Griffin, in litt. 2003); recent confirmed records of lynx in Minnesota (Minnesota Department Natural Resources, in litt. 2003); results from the National Lynx Survey (K. McKelvey, Rocky Mountain Research Station, in litt. 2003); and mapping of lynx habitat on Federal lands (E. Johnston, U.S. Forest Service, in litt. 2003; J. Whitney, Bureau of Land Management, in litt. 2003) provide some of the best current information for our analysis.

Numerous reliable lynx records over a period of years (particularly across a cyclic population low) and reliable evidence of reproduction are considered strong evidence of a resident

population. For example, Washington has had numerous verified lynx records since the 1800s (McKelvey *et al.* 2000b). These records exist in the form of museum specimens (78 specimens), snow tracks, radio-collared study animals, harvest records, remote-camera photographs, and DNA samples. During the period that lynx harvest data were kept (1961–1990) the annual harvest ranged from highs of 39 and 31 animals to lows of 0 in some years. Finally, lynx reproduction has been and continues to be documented numerous times in Washington. As a result of this information, we conclude that Washington has a resident lynx population.

Few and sporadic records, many of which correlate to timeframes when there were cyclic population highs, and no evidence of reproduction are considered evidence of dispersers, rather than resident populations. For example, in Wisconsin only 11 verified records exist from 1870–1961 (McKelvey *et al.* 2000b). There are 16 verified records of lynx from the early 1960s and 1970s that correspond to the extreme cyclic population highs of that period, exceeding the number known for the previous century. Two records from 1992 are the only verified records in the State since the early 1970s, and also correspond to the time period for a cyclic population high. Lynx reproduction has never been documented in Wisconsin. We conclude that Wisconsin has never had a resident lynx population but rather occasional dispersers. We still consider Wisconsin to be in the range of lynx, as discussed in more detail below.

The range of the lynx in the contiguous United States is broadly delineated by the distribution of the southern extensions of boreal forest, which occur in: (1) The Northeast (portions of Maine, New Hampshire, Vermont, New York); (2) the western Great Lakes (portions of Minnesota, Wisconsin, Michigan); (3) the Northern Rocky Mountains/Cascades (portions of Washington, Oregon, Idaho, Montana, northwestern Wyoming, Utah); and (4) the Southern Rocky Mountains (portions of Colorado, southeastern Wyoming) (Agee 2000, Aubry 2000, McKelvey *et al.* 2000). Differences in local climate, primarily precipitation, and effects of elevation have resulted in boreal forest vegetation that differs in the western regions compared to the east (Buskirk *et al.* 2000b); however, spruce and fir are the predominant tree species in both the east and west. Within the borders of the contiguous United States, these regions are separated from each other by vegetation types that do not support lynx (*e.g.*, prairie, deciduous forest). With the exception of the Southern Rocky Mountain region, each of the regions where lynx are found in the contiguous United States are directly connected to lynx populations in Canada.

As described above, maps that accurately display the distribution of boreal forest (and therefore lynx habitat) are not readily available across the contiguous United States The only attempt to portray the range of lynx across the contiguous United States with some degree of precision is that of McKelvey *et al.* (2000b). McKelvey *et al.* (2000b) overlayed lynx occurrence records across the contiguous United States with broad vegetation classifications and topography to determine which vegetative cover types and elevations contain most of the lynx occurrences. In the East (Northeast and Great Lakes), Bailey's (1998) ecoregion classification was used to describe vegetation at the broader scale and in the West (Northern Rocky Mountains/ Cascades and Southern Rocky Mountains) Küchler's (1964) classification was used (McKelvey *et al.* 2000b). Broad-scale vegetative mapping at a continental scale, such as Bailey (1998) or Küchler (1964), results in generalized descriptions that are expected to have some inconsistencies with vegetation maps at a finer scale (T.B. Wigley, National Council on Air and Stream Improvement, Inc., in litt. 2003). However, these broad-scale maps are useful in generally delimiting and describing vegetation types. McKelvey *et al.* (2000b) put some outer bounds on what can reasonably be delineated as the range of lynx. In this analysis, we rely on McKelvey *et al.* (2000b) as our starting point in more precisely defining the range of the lynx.

In the following we summarize key information from the final rule, new information available since the final rule, and the best scientific information provided during the recent comment period to arrive at our analysis of the range of the lynx.

The amount of boreal forest habitat in the contiguous United States has not changed substantially in the past 100 years. In some local areas there has been encroachment by human development but for the most part these habitats are predominantly still forested. In these forests the changes primarily have been the natural and human-caused disturbance processes (fire, insect infestations, wind, ice, timber harvesting) that alter the successional patterns and, sometimes dominant tree species, within a forest.

In the western United States, boreal forests are located at higher elevations and are predominantly under Federal ownership (U.S. Geological Survey 1998). As a consequence, in the west (Northern Rocky Mountains/Cascades and Southern Rocky Mountains) lynx habitat occurs primarily on a Federally-owned land base. The proportion of Federal land base decreases as one progresses eastward. However, in the Great Lakes region most of the lynx records are from northeast Minnesota where the majority of the boreal forest is federally-owned (Minnesota Department Natural Resources in litt. 2003). In the Northeast, nearly all the lynx habitat is privately-owned, most of which is commercial forest in Maine.

Unfortunately, accurate estimates of the amount of lynx habitat on all land ownerships are not available for all regions. In most cases, private landowners have not mapped lynx habitat on their lands, and private landowners have not shared information about their lands with the Service. In the final rule, we cited estimates of the amount of lynx habitat on all ownerships based on coarse maps of vegetation types provided in a biological assessment (U.S. Forest Service and Bureau of Land Management 1999). We recognized that these calculations overestimated the amount of lynx habitat in many areas and possibly underestimated it in other areas, but they provided a perspective on the amount of lynx habitat overall and in the individual regions (T.B. Wigley, in litt. 2003). The biological assessment estimates the following area of lynx habitat: Northeast—65,337 km^2 (25,227 mi^2); Great Lakes—96,247 km^2 (37,161 mi^2); Southern Rockies—26,673 km^2 (10,298 mi^2); Northern Rockies—138,929 km^2 (53,641 mi^2); Cascades—16,964 km^2 (6,550 mi^2) (U.S. Forest Service and Bureau of Land Management 1999). (These calculations were cited in the final rule but were presented as acres, which we have converted into square kilometers and square miles for this rule.) During the most recent public comment period we were provided approximate estimates of the amount of lynx habitat currently mapped on U.S. Forest Service, BLM, and some National Park Service lands (S. Gniadek, National Park Service, in litt. 2003; E. Johnston, USDA Forest Service, in litt. 2003; J. Whitney, BLM, in litt. 2003). This information also is included in Table 1. These estimates for Federal lands will continue to be refined to reflect data obtained through site-specific analysis, field verification, and new information from research that

allows a better understanding and description of lynx habitat (E. Johnston, in litt. 2003). Finally, rough estimates of the amount of lynx habitat on all ownerships in the Northeast based on models of the probability of lynx occurrence also are included in Table 1 (Hoving 2001, Hoving, University of Maine, pers. comm. 2003).

TABLE 1.—ESTIMATES OF LYNX HABITAT[1] WITHIN THE CONTIGUOUS UNITED STATES USED BY THE FISH AND WILDLIFE SERVICE IN THIS ANALYSIS

Land ownership	Northeast	Great Lakes	Southern Rockies	Northern Rockies/Cascades
Federal Lands				
U.S. Forest Service[2]	2,104 km^2 (813 mi^2)	17,685 km^2 (6,828 mi^2).	30,311 km^2 (11,703 mi^2).	N. Rockies: 89,841 km^2 (34,688 mi^2) Cascades: 5,949 km^2 (2,297 mi^2).
Bureau of Land Management[3].	No BLM lands	No BLM lands	716 km^2 (277 mi^2)	1,236 km^2 (477 mi^2).
National Park Service[4].	No NPS lands	Not available	Not available	Yellowstone: 2,784 km^2 (1,075 mi^2) Glacier: 1,103 km^2 (426 mi^2).
Non-Federal Lands				
	Not available	Not available	Not available	Not available.
All Ownerships Combined				
Hoving, pers. comm. 2003[5].	13,511 km^2 (5,217 mi^2) Maine: 12,300 km^2 (4,700 mi^2) New Hampshire: 1,000 km^2 (400 mi^2) Vermont: 12 km^2 (4 mi^2) New York: 190 km^2 (73 mi^2)	Not included in study	Not included in study	Not included in study.

[1] Each of these estimates is qualified (*e.g.*, Yellowstone is likely an overestimate because vegetation mapping has not been refined; therefore, this estimate broadly includes all areas of potential habitat).
[2] E. Johnston (in litt. 2003).
[3] BLM acreages provided by management unit (J. Whitney, BLM, in litt. 2003); therefore, Northern Rocky Mountains and Cascades are not individually identified. BLM acreages not available for Wyoming.
[4] Not all NPS units provided lynx habitat estimates. Acreages from Murphy *et al.* (2003) and S. Gniadek (in litt. 2003).
[5] Fifty percent or greater probability of lynx occurrence in this area based on Hoving (2001).

Northeast

Northeastern United States lynx and snowshoe hare habitat and populations are directly contiguous with those of Canada, south of the St. Lawrence River, in southeastern Quebec and western New Brunswick. Movement of lynx across the St. Lawrence River between populations in northern Quebec and those south of the St. Lawrence is believed to occur infrequently (R. Lafond, Quebec Ministry of the Environment, pers. comm. 1999). However, a substantial lynx population resides south of the St. Lawrence River on Quebec's Gaspé Peninsula, where lynx densities are estimated to be 10 lynx per 100 km^2 (26 per 100 mi^2) during periods of high hare populations (C. Fortin, unpubl. data, in Ray *et al.* 2002). Lynx probably encounter little difficulty moving between southeastern Quebec and northern Maine because habitat is continuous.

Based on an analysis of cover types containing most of the lynx occurrences, McKelvey *et al.* (2000b) determined that, at the broad scale, most lynx occurrence records in the Northeast were found within the broadly described "Mixed Forest-Coniferous Forest-Tundra" cover type. This habitat type occurs along the northern Appalachian Mountain range from southeastern Quebec, western New Brunswick, and western Maine, south through northern New Hampshire. This habitat type becomes naturally fragmented and begins to diminish to the south and west, with a disjunct segment running north-south through Vermont, and a patch of habitat in the Adirondacks of northern New York (McKelvey *et al.* 2000b).

Hoving (2001) modeled lynx habitat across all ownerships for the Northeast region, including Canada south of the St. Lawrence River. Hoving (2001) found that lynx are most likely to occur in areas with deep snow (greater than 268 cm (105 in) mean annual snowfall) and relatively little deciduous cover. Based on this model, potential lynx habitat is concentrated on Quebec's Gaspé Peninsula and northwestern New Brunswick extending into northern Maine. The majority of lynx habitat in this region is found in Canada; only sixteen percent of this area is in the United States. Based on this analysis, there is little lynx habitat in the northeastern United States outside of Maine (Hoving 2001). In the United States, the amount of potential lynx habitat where there is a 50 percent or greater probability of lynx occurrence in this region is roughly 13,501 km^2 (5,177 mi^2) (Table 1) (C. Hoving, University of Maine, pers. comm. 2003). Maine has approximately 12,300 km^2 (4,700 mi^2) of potential lynx habitat, New Hampshire has 1,000 km^2 (400 mi^2), Vermont has 11 km^2 (4 mi^2), and New York has 190 km^2 (73 mi^2) (C. Hoving, pers. comm. 2003).

Maine-Lynx have been documented in Maine since the 1800s, although accounts are irregular and anecdotal for some time periods (Hoving 2001; R. Joseph, U.S. Fish and Wildlife Service, in litt. 1999). Lynx occurrences have been fairly consistent since the 1950s (Hoving 2001; R. Joseph, in litt. 1999). Historical accounts provide evidence of the reproduction and persistence of lynx in several northern and western townships (Hoving 2001; R. Joseph, in litt. 1999). Since 1999, intensive lynx research in northern Maine has resulted in 30 different lynx radio-collared, and

17 litters with 37 kittens, documented in the 300-km² (100-mi²) study area (Maine Department of Inland Fisheries and Wildlife 2003; G. Matula, in litt. 2003), demonstrating the current existence of a resident population.

Lynx habitat in Maine is considered to be of high quality at this time. The quantity of boreal forest that can potentially support lynx in Maine has not changed substantially in the past 100 years (G. Matula, in litt. 2003). Extensive clear cutting to salvage diseased trees in the 1970s and 1980s resulted in large amounts of the forest presently in a stage of regeneration that is optimal for snowshoe hares (Hoving 2001; Homyack 2003, Krohn 2003; G. Matula, in litt. 2003). Snowshoe hare densities are high (1.6–2.4 hares per hectare (ha) (4.0–5.9 per acre (ac))) in these regenerating stands (Homyack 2003; G. Matula, in litt. 2003). As a result, lynx numbers have increased in response to improved habitat conditions and increased snowshoe hare populations. In a 300-km² (100-mi²) study area in northern Maine, the preliminary estimate of lynx density in fall 2002 was 4.4 lynx per 100 km² (11.4 per 100 mi²) (G. Matula, in litt. 2003). Based on preliminary analyses, lynx home ranges in this study area average 52 km² (20 mi²) for females and 70 km² (27 mi²) for males (G. Matula, in litt. 2003); these relatively small home ranges are likely an indication of high habitat quality with abundant snowshoe hares. Coincidentally, these optimal habitat conditions occur during a period when hares and lynx should be at a cyclic high, although evidence of hare population cycles are less clear in this region. Maine's lynx numbers are expected to fluctuate in concert with hare population fluctuations.

New Hampshire—Although habitat in New Hampshire is contiguous with that in Maine, the amount of current or historical lynx habitat in New Hampshire is much less than in Maine. Recent modeling predicted approximately 1,000 km² (400 mi²) (Hoving 2001; C. Hoving, pers. comm. 2003). Most of the lynx records are from harvest that occurred in the 1930s, ranging from 1 to 20 per year (Brocke *et al.* 1993, McKelvey *et al.* 2000b). Between 1940 and 1964, lynx harvests were lower, ranging from 0 to 3 lynx trapped per year. For 11 of these 24 years, the harvest was zero (McKelvey *et al.* 2000b). The trapping season was closed in 1964 in response to apparent declines in lynx abundance reflected in harvest returns (Siegler 1971; Silver 1974; Litvaitis *et al.* 1991). Since the 1960s, reports of lynx in New Hampshire have been rare; only two reports exist from the 1990s (M. Amaral, U.S. Fish and Wildlife Service, in litt. 1999). Although there are no records of lynx breeding in New Hampshire, based on regular harvest reports from the past and connectivity with habitats in Maine where resident lynx occur, we believe that a small resident lynx population historically occurred in New Hampshire but no longer exists. However, dispersers likely still occur in New Hampshire because of its connectivity with Maine; lynx have recently been documented in Maine near the New Hampshire border (M. McCollough, pers. comm. 2003).

Vermont—Little boreal forest exists currently or historically in Vermont and what habitat exists is isolated from that in New Hampshire (W. Laroche, Vermont Department of Fish and Wildlife, in litt. 2003). Only four verified records of lynx exist for Vermont (McKelvey *et al.* 2000b; W. Laroche, in litt. 2003). There is no evidence lynx reproduction ever occurred in Vermont. In the Green Mountain National Forest, all potential lynx habitat occurs in small patches that are not large enough to support a lynx; bobcats are present throughout these areas (P. Brewster, Green Mountain and Finger Lakes National Forests, in litt. 2000), evidence that these areas are not suitable for lynx. Hoving's (2001) model predicts only approximately 11 km² (4 mi²) of potential lynx habitat in Vermont (C. Hoving, pers. comm. 2003). Based upon the limited amount and dispersed nature of suitable habitat, we conclude lynx have occurred in Vermont as dispersers that have never established resident populations. It is still possible for lynx to disperse to Vermont.

New York—An "island" of boreal forest exists both historically and currently in the Adirondack Mountains of New York. A resident lynx population reportedly occurred in the northern region of New York, particularly in the Adirondack Mountains, but it was considered extirpated by 1900 (Brocke 1982, McKelvey *et al.* 2000b). However, there are 23 verified lynx occurrences since 1900, primarily from the Adirondack Mountains (McKelvey *et al.* 2000b). The most recent verified record was from 1973 (McKelvey *et al.* 2000b), which correlates to an extreme cyclic population high. Habitat and prey conditions were deemed suitable for a lynx reintroduction in 1989–1991 (Brocke 1982). The reintroduction was unsuccessful in establishing a population. Hoving's 2001 model predicted approximately 190 km² (73 mi²) of potential lynx habitat in New York (C. Hoving, pers. comm. 2003), an area only slightly larger than the average home range of a single male lynx. The boreal forest in New York is protected as Adirondack State Park and much of the forest is mature without the understory necessary to support a snowshoe hare population capable of sustaining lynx (G. Batcheller, New York State Division of Fish, Wildlife and Marine Resources, pers. comm. 2003). It appears habitat quality is marginal. We conclude that a resident population may have existed in New York prior to 1900; however, records of lynx since 1900 are of dispersers.

Northeast Summary—As it did historically, the boreal forest of the Northeast continues to exist primarily in Maine where habitat is currently optimal and a resident, breeding population of lynx continues to exist. Maine's lynx population is currently much larger than we knew at the time of the final rule in 2000 and habitat is directly connected to substantive lynx populations and habitat in southeastern Quebec and New Brunswick. The potential exists for lynx to occur in New Hampshire because of its direct connectivity with Maine and we presume they currently occur there. Lynx in Vermont have always existed solely as dispersers. Lynx occurring in New York since 1900 have been dispersers.

Great Lakes

At the time of the final listing rule for lynx, the coarse-scale vegetation description, "mixed deciduous-coniferous forest" was used to characterize potential lynx habitat in the Great Lakes Region because it encompassed 88 percent of lynx occurrence records in this region (McKelvey *et al.* 2000b). As mapped (Bailey 1998, McKelvey *et al.* 2000b), the mixed deciduous-coniferous forest covers an extensive area in the western Great Lakes region, primarily in northeastern Minnesota, northern Wisconsin, and the western portion of Michigan's upper peninsula, giving the appearance of a large expanse of continuous boreal forest and creating the expectation of resident lynx populations throughout this large area.

However, this broad vegetation description encompasses large areas that are not lynx habitat, particularly in Wisconsin (Wisconsin Department Natural Resources, in litt. 2003). As can be seen in maps of Early Settlement Vegetation, historically spruce and fir (the predominant type of trees in the boreal forest) were most abundant in northeastern Minnesota, which is contiguous with boreal forest in Ontario,

Canada, whereas in Michigan and especially Wisconsin, spruce and fir were limited to scattered patches (Great Lakes Ecological Assessment no date, Mladenoff no date, Wisconsin Department Natural Resources, in litt. 2003). Therefore, within the Great Lakes region, potential lynx habitat has always been most abundant in northeastern Minnesota.

An accurate estimate of the amount of potential lynx habitat for all ownerships in the Great Lakes region was not available to us. The majority of potential lynx habitat in this region is in northeastern Minnesota under Federal ownership, although we cannot say precisely how much because we do not have acreages of lynx habitat on non-Federal lands. In the Great Lakes region, as currently mapped there are approximately 18,000 km ^{2} (7,000 mi ^{2}) of potential lynx habitat on National Forest lands (Table 1). This estimate includes National Forest lands in Minnesota and Michigan's Upper Peninsula. There is no potential lynx habitat on National Forest lands in Wisconsin (Weiland 2002).

Minnesota—As was true historically, northeastern Minnesota continues to support a substantial amount of transitional boreal forest (roughly estimated at 12,500 km ^{2} (4,800 mi ^{2})) in a more evenly distributed pattern rather than in small patches (Great Lakes Ecological Assessment no date, Wisconsin Department Natural Resources, in litt. 2003). In Minnesota, the deepest snows occur in the northeast corner of the State (Minnesota Department Natural Resources in litt. 1998). Most of northeastern Minnesota is under Federal ownership, primarily in the Superior National Forest (Minnesota Department Natural Resources, in litt. 2003).

Minnesota provides a good example of the problems in assessing the status of lynx because of the complexity of lynx cycles and the difficulty in interpreting historical lynx occurrence data. As a result, scientists have debated whether lynx in Minnesota are members of a long-term resident population or dispersers from Canada that do not establish a resident population in the State (McKelvey *et al.* 2000b; R. Sando, Minnesota Department of Natural Resources, in litt. 1998). Minnesota has a substantial number of historic lynx reports, primarily trapping records (McKelvey *et al.* 2000b), as expected because of the direct connectivity of the boreal forest in northeastern Minnesota with that of Ontario, Canada, where lynx occur. Harvest and bounty records for Minnesota are available since 1930. Approximate 10-year cycles are apparent in the data, with highs in the lynx cycle in 1940, 1952, 1962, and 1973 (Henderson 1978; McKelvey *et al.* 2000b). During a 47-year period (1930–1976), the Minnesota lynx harvest was substantial, ranging from 0 to 400 per year (Henderson 1978). These harvest returns for Minnesota are believed to be driven by immigration from Canada (Henderson 1978; Mech 1980; McKelvey *et al.* 2000b; M. DonCarlos, Minnesota Department of Natural Resources in litt. 1994). Outside of harvest data, 76 additional verified lynx records exist for Minnesota before 2001 (McKelvey *et al.* 2000b).

Reproduction and maintenance of home ranges by lynx were documented in the early 1970s (Mech 1973, 1980), potential evidence of the presence of a resident population. But this may have been an artifact of the early 1970s being a period of an extreme peak in the population cycle in Canada. Records of lynx in Minnesota have been rare in the past 2 decades; there were only 3 verified records of lynx in Minnesota in the 1990s (M. DonCarlos, in litt. 1994).

Individuals knowledgeable about lynx and snowshoe hares suggest that fires and logging created early successional forests that were conducive to abundant hare populations in northern Minnesota in the first half of the 20th century (S. Loch, in litt. 2003), resulting in the high numbers of lynx recorded during that time. In contrast, snowshoe hare numbers were exceptionally low in the 1980s through the 1990s (S. Loch, in litt. 2003), likely explaining the scarcity of lynx. Based on surveys in northern Minnesota, snowshoe hare numbers are currently high (J. Erb, Minnesota Department of Natural Resources, in litt. 2003).

In the past 3 years there have been 62 verified reports of lynx in northeastern Minnesota, 6 of which provided evidence of reproduction (usually visual observations of kittens accompanying an adult) (Minnesota Department of Natural Resources, in litt. 2003; S. Loch, in litt. 2003); it is assumed some of these reports are of the same animal or family group so the actual number of animals is likely lower. This dramatic increase in reports corresponds with a cyclic population high directly adjacent in Ontario (S. Loch, in litt. 2003). Research has been initiated that will help determine whether these animals are members of an established resident population in Minnesota or if these animals fail to persist when the cyclic population high recedes (University of Minnesota, in litt. 2002).

Lynx presence in Minnesota is an artifact of the international border between Canada and the United States artificially splitting the lynx range in this area into two pieces of a whole that exists primarily in adjacent Ontario, highlighting a phenomenon that occurs with differing magnitude all along the international border where lynx habitat occurs on both sides of the border. It appears the Ontario lynx population sometimes expands and occupies northeastern Minnesota and sometimes it contracts and lynx recede from Minnesota. As a result, northeastern Minnesota may not always support lynx. However, we conclude that northeastern Minnesota often supports a resident lynx population because there is ample boreal forest habitat directly connected with that in Ontario, there is a high number of historic lynx records, evidence of lynx reproduction and cyclically abundant snowshoe hares.

Wisconsin—The mapping of Wisconsin shows the discrepancy that can occur between broad-scale vegetation mapping and more precise vegetation maps. Maps of the early vegetation of Wisconsin delineate only small patches of boreal forest primarily along the shore of Lake Superior in extreme northern Wisconsin (Mladenoff no date; Wisconsin Department Natural Resources, in litt. 2003; S. Hassett, in litt. 2003) compared to one third of the State being mapped as mixed deciduous-coniferous forest as broadly classified by Bailey (1998) (McKelvey *et al.* 2000b). Therefore, it is clear that historically in Wisconsin there actually was very little boreal forest and, as a result, little potential lynx habitat (Mladenoff no date; S. Hassett, in litt. 2003; Wisconsin Department Natural Resources, in litt. 2003). Where appropriate lynx forest types do occur in Wisconsin, historic snow conditions have not been optimal for lynx (Weiland 2002). This habitat is more appropriate for bobcats, which are common and well-distributed in northern Wisconsin (S. Hassett, in litt. 2003). As a result, no lynx habitat was mapped on U.S. Forest Service lands in Wisconsin because of a lack of appropriate habitat and snow depth to support lynx (Weiland 2002).

Verified reports of lynx in Wisconsin are limited (29 records from 1870 to 1992) (McKelvey *et al.* 2000b); 16 of these reports are associated with unprecedented cyclic highs that occurred throughout Canada in the early 1960s and 1970s. In 1992, two lynx mortalities were reported (Wydeven 1993; C. Pils, in litt. 1994). No sign of lynx has been found during extensive snow track surveys in potential lynx habitat in northern Wisconsin over the past 4 years (S. Hassett, in litt. 2003). There are no records of lynx breeding in Wisconsin.

Because Wisconsin always has had a limited amount of boreal forest habitat, marginal snow conditions for lynx, and no evidence of reproduction, we concur with Thiel (1987) that, historically, Wisconsin has not supported a permanent, self-sustaining lynx population; rather, lynx presence is associated with cyclic lynx population fluctuations in Canada. We conclude that any lynx found in Wisconsin are dispersers, not residents.

Michigan—Michigan's Upper Peninsula supports boreal forest, and lynx habitat has been mapped on U.S. Forest Service lands in the Upper Peninsula (Great Lakes Ecological Assessment no date; J. Trick, U.S. Fish and Wildlife Service, pers. comm. 2003). Beyer *et al.* (2001) suggested habitat in the Upper Peninsula is limited. Additionally, Lake Superior nearly isolates the Upper Peninsula from source lynx populations in Canada, limiting the number of animals available to successfully establish a population. The majority of occurrences are on the eastern part of the Upper Peninsula where the largest patch of boreal forest historically occurs (Great Lakes Ecological Assessment no date) and which is the shortest distance (lynx can cross the St. Mary's River) from lynx populations in Ontario, Canada. Beyer *et al.* (2001) documented 39 verified records of lynx from Michigan's Upper Peninsula between 1940 and 1997. Twenty-seven of these records correlate with an extreme cyclic high in Canada in the early 1960s (Beyer *et al.* 2001). McKelvey *et al.* (2000b) found 44 verified records Statewide from the mid 1800s until 1983 (Harger 1965; McKelvey *et al.* 2000b). The Lower Peninsula naturally had very little boreal habitat (Great Lakes Ecological Assessment no date) and was even more isolated from source lynx populations in Canada by Lakes Huron and Michigan. Six records exist for Michigan's lower peninsula, all from 1917 or earlier (Harger 1965; McKelvey *et al.* 2000b). There is no evidence of lynx reproduction in Michigan (Beyer *et al.* 2001). Beyer *et al.* (2001) concluded a resident lynx population does not occur in the Upper Peninsula and that dispersers occur only occasionally.

We include Michigan's Upper Peninsula within the range of lynx because it supports some boreal forest and periodically lynx have been present but we conclude that limited number of lynx occurrences did not constitute a resident population but were dispersers. We do not include Michigan's Lower Peninsula because the few historic reports of lynx were in non-lynx habitat.

Great Lakes Summary—We conclude that northeastern Minnesota has historically supported and currently supports a resident lynx population, based on the number of lynx records, evidence of reproduction, and the presence of boreal forest contiguous with occupied habitat in Ontario. Currently, there are many more lynx in northeastern Minnesota than we knew of at the time of the final rule in 2000. We conclude records of lynx in Wisconsin and Michigan constitute dispersing animals, rather than individuals from resident populations, based on the lack of evidence of reproduction, lack of connectivity with suitable habitat, and limited amount of habitat.

Northern Rocky Mountains/Cascades

In this region, the majority of lynx occurrences are associated with the "Rocky Mountain Conifer Forest" in the Rocky Mountains of Montana, Idaho, eastern Washington, and Utah, and the Cascade Mountains in Washington and Oregon. The boreal forest of northern Washington, northern Montana, and northern Idaho is directly contiguous with that in adjacent British Columbia and Alberta, Canada. In this mountainous area, lynx habitat occurs at higher elevations and, therefore, is naturally fragmented by topography into island-like patches (McKelvey *et al.* 2000b). Lynx cross intervening landscapes, made up of shrub-steppe, grassland, low-elevation forested or unforested valleys, and in some cases, desert, to reach these habitat "islands." We combine the Northern Rocky Mountains and Cascades together for our analysis because the Cascades and Northern Rocky Mountains regions are only separated by the Okanogan River Valley in northern Washington and because of similar conditions in both regions. Additionally, the Cascades alone supports the smallest amount of lynx habitat in the contiguous United States. Approximately 99 percent of the lynx habitat in the Cascades was estimated to occur on National Forest lands (U.S. Forest Service and Bureau of Land Management 1999); based on current mapping there are nearly 6,000 km^2 (2,300 mi^2) of lynx habitat on National Forest lands in the Cascades (Table 1). By contrast, the Northern Rocky Mountains alone support the largest amount of lynx habitat in the contiguous United States. Approximately 67 percent of the lynx habitat in the Northern Rocky Mountains was estimated to occur on National Forest lands (U.S. Forest Service and Bureau of Land Management 1999), and based on current mapping there are nearly 96,000 km^2 (37,000 mi^2) of lynx habitat just on National Forest lands in the Northern Rocky Mountains (Table 1). The relatively small size and close proximity of the lynx habitat in the Cascades to that in the Northern Rocky Mountains further supports considering both areas as one.

The majority of lands within the mountain ranges in this region are under Federal ownership, predominantly as National Forest lands. As a result, within this region a large amount of lynx habitat is found on Federal lands; as currently mapped, there are approximately 89,841 km^2 (34,688 mi^2) of lynx habitat on National Forest land in the Northern Rockies and 5,949 km^2 (2,297 mi^2) of lynx habitat on National Forest lands in the Cascades; approximately 1,300 km^2 (490 mi^2) on BLM lands; approximately 2,900 km^2 (1,100 mi^2) in Yellowstone National Park; and approximately 1,100 km^2 (430 mi^2) in Glacier National Park (Table 1). Estimates of the quantity of lynx habitat were not available for all National Park Service units in this region.

Washington—Washington has a long record of verified lynx occurrences over the past century. Resident lynx populations were historically found in the northeast and north-central regions and along the east slope of the Cascade Mountains (McKelvey *et al.* 2000b, Stinson 2001). There are a few historic records of lynx in the southern part of the Cascades in Washington near Mt. Adams (Stinson 2001). Trapping data kept since 1961 reflect cyclic patterns (McKelvey *et al.* 2000b). The largest harvests were taken in 1969–1970 (31 lynx) and 1976–1977 (39 lynx) (Washington Department of Wildlife 1993). Results of snow track surveys, remote cameras, and DNA surveys show that lynx continue to occupy north-central and northeast Washington (Base and Zender 2001; Stinson 2001; Aubry *et al.* 2002; B. Maletzke, Okanagon National Forest, in litt. 2003; K. McKelvey, in litt. 2003). Recent records of lynx reproduction also exist for Washington (Stinson 2001; B. Maletzke, in litt. 2003). We conclude resident lynx populations continue to exist in Washington.

Oregon—There is no evidence that a resident lynx population ever occurred in Oregon (Verts and Carraway 1998; K. McKelvey and K. Aubry, Rocky Mountain Research Station, in litt. 2001). Only 12 verified records of lynx exist for Oregon for the past century (Verts and Carraway 1998, McKelvey *et al.* 2000b). The majority of these records are from marginal or non-lynx habitats and correlate with cyclic highs in

northern lynx populations (Verts and Carraway 1998; K. McKelvey and K. Aubry, Rocky Mountain Research Station, in litt. 2001). We do not consider compilations of anecdotal reports of lynx in Oregon reliable for the reasons described by McKelvey and Aubry (Rocky Mountain Research Station, in litt. 2001). Habitats in Oregon that are potentially suitable for lynx are naturally isolated from occupied habitats in Washington and Idaho. There are no records of lynx reproduction in Oregon. Based on the limited verified records of lynx, lack of evidence of lynx reproduction, frequency of occurrences in atypical habitat, and the correlations of such occurrences with cyclic highs, we believe that lynx occur in Oregon as dispersers that have never maintained resident populations.

Idaho—According to Rust (1946), lynx were not abundant but were distributed throughout northern Idaho in the early 1940s, occurring in 8 of the 10 northern and north-central counties. McKelvey *et al.* (2000b) located a number of lynx specimen records from Idaho collected during the early 1900s. Between 1960 and 1991, 35 verified records exist for Idaho, with 13 of these from 1982 to 1991 (McKelvey *et al.* 2000b). Lynx reports in Idaho have been few in the past 20 years. The Idaho Conservation Data Center (2003) has four reports since 2000, and a lynx was confirmed by DNA evidence on the Boise National Forest (K. McKelvey, in litt. 2003). Because past records of lynx in northern and north-central Idaho are common and boreal forest in Idaho is contiguous with boreal forest in Washington, Montana, and British Columbia, Canada, where resident lynx populations are known to exist, we conclude that lynx continue to be present in northern and north-central Idaho, which have the capacity to support a resident population.

Montana—In Montana, numerous historic and current lynx records exist throughout the Rocky Mountain Conifer Forest in the western part of the State (McKelvey *et al.* 2000b; P. Graham, Montana Department of Fish, Wildlife, and Parks, in litt. 1998). Montana's harvest records since the 1950s reflect cyclic lynx populations (McKelvey *et al.* 2000b). Since Montana started accurately recording lynx harvest in 1977, Montana's largest lynx harvests occurred in both 1979 and 1984 when 62 lynx were taken each season (McKelvey *et al.* 2000b; B. Giddings, Montana Department of Fish, Wildlife, and Parks, in litt. 1994). Harvest records, winter track surveys conducted since 1990/1991, and trapper logbooks, led Montana Department of Fish, Wildlife, and Parks to conclude that the State's lynx population is distributed throughout what it determined to be "predicted lynx habitat" (P. Graham, Montana Fish, Wildlife and Parks, in litt. 1998). Snow track surveys have documented lynx tracks throughout the range in western Montana (P. Graham, in litt. 1998). Reproduction is documented; 14 dens were located between 1999 and 2001 in a study area in northwestern Montana (Brainerd 1985, Squires and Ruggiero 2001). In some mountain ranges in southwest Montana, lynx are present but in apparently low numbers, based on recent surveys (Gehman and Robinson 2000, Squires *et al.* 2002). We conclude that a resident population of lynx is distributed throughout suitable habitat in the northern and central mountain ranges in western Montana, whereas in the mountains in southwestern Montana, habitat naturally becomes more marginal (more patchy and drier forest types) and supports dispersers more often than resident populations.

Wyoming—Most historical and recent records of lynx in Wyoming are from the northwestern mountain ranges (Reeve *et al.* 1986; McKelvey *et al.* 2000b; B. Wichers, Wyoming Game and Fish, in litt. 2003). McKelvey *et al.* (2000b) found only 30 verified records Statewide since 1856. Lynx reports from Yellowstone National Park have always been rare; since 2001, lynx survey efforts in the Park have detected one lynx (Murphy *et al.* 2003). In west-central Wyoming, a female lynx with kittens was documented in 1998 (Squires and Laurion 2000). However, the female died of starvation and it is presumed the kittens also died, perhaps indicating inadequate habitat and prey base (Squires *et al.* 2001). A male lynx was radio-tracked moving long distances from its home range in west-central Wyoming and into Yellowstone National Park as recently as 2001 (Squires *et al.* 2001). It is possible, based on recent evidence of reproduction, that in the past a resident lynx population occurred in northwestern Wyoming. However, few lynx have been found during several recent surveys. We believe this is because the habitat is naturally marginal (more patchy and drier forest types) and less capable of supporting snowshoe hares (B. Wichers, in litt. 2003), and is farther from source populations. Therefore, we believe lynx currently in Wyoming are dispersers and that the habitat may not be able to support resident populations.

Utah—There are only 10 verified records of lynx in Utah since 1916 (McKay 1991; McKelvey *et al.* 2000b). Nearly all the reliable lynx reports are from the Uinta Mountain Range along the Wyoming border (McKay 1991). Four of the records correlate to the cyclic highs of the 1960s and 1970s. Recent DNA results documented the presence of a lynx in Utah (McKelvey in litt. 2003). There is no evidence of lynx reproduction in Utah. We conclude that lynx that occur in Utah are dispersers rather than residents, because most of the few existing records correspond to cyclic population highs, there is no evidence of reproduction, and boreal forest habitat in Utah is remote and far from source lynx populations.

Northern Rocky Mountains/Cascades Summary—In summary, we conclude that the Northern Rocky Mountains/Cascades Region continues to support resident lynx populations in north-central and northeastern Washington, western Montana and likely northern Idaho. We conclude that lynx have always occurred as dispersers in Oregon and Utah. In northern Wyoming it appears habitat is less suitable to support resident populations and, therefore, we conclude animals in this area are most likely dispersers.

Southern Rocky Mountains

This area represents the extreme southern edge of the range of the lynx. The southern boreal forest of Colorado and southeastern Wyoming is isolated from boreal forest in Utah and northwestern Wyoming by the Green River Valley and the Wyoming basin (Findley and Anderson 1956 in McKelvey *et al.* 2000b). These habitats reduce opportunities for emigration from the Northern Rocky Mountains/ Cascades Region and Canada, and may isolate lynx in the Southern Rocky Mountains in Colorado and southeastern Wyoming (Halfpenny 1982; Koehler and Aubry 1994). However, the potential still exists for lynx to immigrate to the southern Rocky Mountains, particularly during extreme cyclic population highs.

As in the Northern Rocky Mountains/ Cascades region, lynx habitat in the Southern Rocky Mountain region occurs at high elevations and, therefore, is naturally fragmented by topography and drier south- and west-facing slopes into island-like patches rather than expansive, contiguous blocks (Ruediger *et al.* 2000). Accurate estimates of the amount of lynx habitat on all land ownerships in the Southern Rocky Mountain region are not available. The only estimate of lynx habitat on all ownerships was based on coarse maps of vegetation types that contained the majority of lynx occurrences; based on this type of mapping, it was roughly

estimated that there were 27,000 km^2 (10,300 mi^2) of potential lynx habitat across all ownerships in this region (U.S. Forest Service and Bureau of Land Management 1999). All of this habitat is found in the mountains, which are primarily under Federal ownership (U.S. Geological Survey 1998). In the Southern Rocky Mountains region, as currently mapped there are approximately 30,000 km^2 (12,000 mi^2) of lynx habitat on U.S. Forest Service lands and approximately 700 km^2 (280 mi^2) on BLM lands (Table 1) (E. Johnston, in litt. 2003; J. Whitney, in litt. 2003).

Colorado—The montane and subalpine forest ecosystems in Colorado are naturally highly fragmented (Thompson 1994), which we believe has always limited the potential for lynx. Most historic records are distributed among the northern and central mountain ranges in Colorado (McKelvey *et al.* 2000, Meaney 2002). There is a great deal of inconsistency among historic lynx reports for Colorado (Meaney 2002); as a result, it is difficult to interpret historic records and we question some of the numbers reported. However, based on available information, Thompson and Halfpenny's (1989) description seems accurate: "it is unlikely lynx were ever very common and have probably existed as discontinuous, remnant populations," a conclusion that is supported by the State of Colorado (T. Blickensderfer, in litt. 2003). A total of 22 positive lynx reports exist in State records since the late 1800s (J. Mumma, Colorado Division of Wildlife, in litt. 1998); although McKelvey *et al.* (2000b) considered only 17 of these records "verified." The last verified lynx specimens were taken in 1973–1974 (Halfpenny *et al.* 1982; T. Blickensderfer, in litt. 2003); which coincided with extreme cyclic population highs that occurred throughout the west and Canada. No verified records of lynx exist since 1974; however, extensive survey efforts have resulted in periodic reports of lynx tracks (Halfpenny and Miller 1981; Thompson and Halfpenny 1989; Anderson 1990; Thompson and Halfpenny 1991; Andrews 1992; Carney 1993; Fitzgerald 1994; Colorado Division of Wildlife *et al.* 1997; T. Blickensderfer, in litt. 2003). Based on historic lynx records, we are uncertain whether Colorado supported a small resident lynx population that may have been extirpated or whether historic records were of dispersers that arrived during extremely high population cycles. If these historic records did represent resident populations rather than solely dispersing animals that emigrated from the Northern Rocky Mountains/Cascades or Canada that were unable to sustain persistent populations, we believe a viable native resident lynx population no longer exists in Colorado. We believe the most likely cause for the loss of resident lynx populations in Colorado was a natural process because lynx in this region are isolated from source lynx populations and habitats. Immigration appears necessary to augment and maintain local lynx populations, especially in transitional habitats at the southern margins of lynx range. The distance and isolation of this region from source populations outside of the Southern Rocky Mountains severely reduced, if not entirely precluded, the immigration that was likely necessary for the lynx population of this region to sustain itself. If these historic records were of dispersers that arrived when there were extremely high population cycles, it would be inappropriate to conclude these populations were extirpated because dispersers can continue to arrive in these areas in the future.

In 1997, the Colorado Division of Wildlife in cooperation with numerous government and private entities began a program to introduce lynx from Canada and Alaska into Colorado in an effort to reestablish a resident lynx population. In 1999 and 2000, 96 lynx were released into in Colorado with the intention of releasing an additional 186 lynx between 2003 and 2009 (T. Blickensderfer, in litt. 2003). It is too early to determine whether this effort will be successful (T. Blickensderfer, in litt. 2003), although reproduction has been recently documented (T. Malmsbury, in litt., 2003).

Southeastern Wyoming—Habitat in southeastern Wyoming is contiguous with that in Colorado. Records from southeastern Wyoming are scarce (Reeves 1986, McKelvey 2000b). The most recent record is from the Laramie Range in 1963, a time when the lynx population cycle was at an unprecedented high. The core of lynx range in this region was in Colorado. Because habitat in this area is naturally marginal, patchy, and less suitable for snowshoe hares (B. Wichers, in litt. 2003) and there are extremely few historic records of lynx in southeastern Wyoming with no evidence of breeding, we conclude a resident population never existed in southeast Wyoming and that reports of lynx were of dispersers.

Southern Rocky Mountains Summary—We are uncertain whether lynx in this region historically occurred as a resident population or if historic records were of periodic dispersers. We conclude that if a resident lynx population historically occurred in the Southern Rocky Mountains, then this native population has been lost. We surmise the primary cause for the loss of this population was its natural isolation from potential source populations. Although habitats in the Southern Rockies are far from source populations and more isolated, it is still possible that dispersers could arrive in the Southern Rocky Mountains during extreme highs in the population cycle. It remains to be seen if the State of Colorado's reintroduction program will reestablish a resident lynx population.

Habitat-Related Threats Analysis

The final rule discussed the factors affecting lynx habitat, which included human alteration of the distribution and abundance, species composition, successional stages, and connectivity of forests, and the resulting changes in the forest's capacity to sustain lynx populations. The final rule noted that two important human influences on snowshoe hare habitat are timber harvest and fire suppression; however, the final rule acknowledged that information about how lynx populations respond to these specific impacts is limited. Studies of lynx and snowshoe hare have documented lynx presence and reproduction and snowshoe hare abundance in a variety of managed landscapes (Apps 2000; Squires and Laurion 2000; Squires and Ruggiero 2001; Stinson 2001; Homyack 2003; Maine Department of Inland Fisheries and Wildlife 2003; Minnesota Department of Natural Resources, in litt. 2003; G. Matula, in litt. 2003; Mills and Griffin, in litt. 2003).

In the final rule we cited calculations of the extent of lynx habitat encompassed in certain regions, land ownerships, and land management designations. These calculations were provided to us in a biological assessment (U.S. Forest Service and Bureau of Land Management 1999). Because these calculations were based on coarse mapping of vegetation types, they overestimated the amount of lynx habitat in many areas (particularly in the Great Lakes, as described above) and possibly underestimated it in other areas, but they nonetheless provided a perspective on the amount of lynx habitat overall and the proportions in various ownerships and land management designations. Since the final rule, lynx habitat has been mapped on Federal lands in order to conduct analyses under section 7 of the Act. As a result, estimates of the amount of lynx habitat on some Federal lands are more

accurate than in the 1999 biological assessment (U.S. Forest Service and Bureau of Land Management 1999; S. Gniadek, in litt. 2003; E. Johnston, in litt. 2003; J. Whitney, Bureau of Land Management, in litt. 2003). Refined calculations for all ownerships were not provided; therefore it was not possible to recalculate the information in the biological assessment for the purposes of this remanded decision. Nonetheless, for the Southern Rocky Mountains and Northern Rocky Mountains/Cascades, we believe the proportions of lynx habitat provided in the biological assessment are still fairly accurate and useful because if the same refinements and mapping that occurred on National Forest and BLM lands were applied to non-Federal lands it would presumably result in similar adjustments. Therefore, in this analysis we will use the proportions of Federal and non-Federal lands in the Northern Rocky Mountains/ Cascades and Southern Rocky Mountains, and the proportions in either developmental or non-developmental management designations for the Northern Rocky Mountains/Cascades, Southern Rocky Mountains, and Great Lakes provided in the biological assessment and used in the final rule.

In all regions where the lynx range in the contiguous United States, timber harvest and its related activities are the predominant land use affecting lynx habitat. The final rule stated that timber harvest and associated forest management can be benign, beneficial, or detrimental to lynx depending on harvest methods, spatial and temporal specifications, and the inherent vegetation potential of the site. Some timber harvest regimes can result in reduced cover, unusable forest openings, and large monotypic stands with sparse understories that are unfavorable for lynx and snowshoe hare (de Vos and Matel 1952; Harger 1965; Hatler 1988; Brittell *et al.* 1989; Koehler 1990; Hoving 2001; Homyack 2003; Mills and Griffin, in litt. 2003). Mechanical thinning (pre-commercial thinning) of densely stocked young stands to promote vigorous growth of fewer trees can reduce the stem densities required to support high numbers of snowshoe hare (U.S. Forest Service *et al.* 1999a; Homyack 2003; Mills and Griffin, in litt. 2003).

The final rule explained that forestry practices can be beneficial when the resulting understory stem densities and structure meet the forage and cover needs of snowshoe hare (Keith and Surrendi 1971; Fox 1978; Conroy *et al.* 1979; Wolff 1980; Parker *et al.* 1983; Litvaitis *et al.* 1985; Monthey 1986; Bailey *et al.* 1986; Koehler 1990; McKelvey *et al.* 2000d). Snowshoe hare densities tend to be highest in regenerating stands with very high stem densities (Hodges 2000a, 2000b, Griffin and Mills in press, Homyack 2003). Although large openings initially may not be used by snowshoe hare and lynx, regeneration harvest units (*e.g.*, clear-cut) in appropriate habitat types eventually (in 10 years or more depending on the type of forest) achieve early successional stages with dense understories as preferred by snowshoe hares (Monthey 1986; Quinn and Parker 1987; Koehler 1990; Koehler and Brittell 1990; Washington Department of Wildlife 1993; McKelvey *et al.* 2000c; Hoving 2001; Homyack 2003). Lynx can readily move across landscapes fragmented by commercial forestry (Squires and Laurion 2000).

The final rule suggested that large clear-cut may be detrimental to lynx because they might eliminate the mosaic forest ages and structure needed by lynx. We have learned since publication of the final rule that, in northern Maine, optimal forest conditions for lynx and snowshoe hares have been created as a result of large-scale clear cutting in the 1970s and 1980s to salvage spruce and fir stands damaged by insects. A large proportion of Maine's northern forest is currently in a stage of regeneration that provides dense understories where snowshoe hares are most abundant (Hoving 2001; Homyack 2003; Krohn 2003; G. Matula, in litt. 2003). Despite extensive clear cutting, the forests of northern Maine continue to provide a mosaic of forest ages and structure, such as required for lynx denning. As a result, Maine lynx populations are high (see "Maine" discussion above). Larger openings, such as created by clear-cut, can often more closely resemble vegetative patterns that follow natural disturbance events (*e.g.*, fire, windthrow, and insect outbreaks) and decrease amounts of edge favorable to generalist predators (McKelvey *et al.* 2000c, Krohn 2003). We anticipate that where good snowshoe hare and lynx habitat occurs within the contiguous United States, regenerating stands that result after large clear-cut can be managed to allow regrowth of a dense understory, so that they too will provide good conditions for snowshoe hares and lynx.

Recent research in Maine and Montana measured the effects of some timber harvest regimes on snowshoe hare populations, which has implications for lynx. In Maine in 2000–2002, snowshoe hare densities were highest in unthinned, 12- to 20-year old clear-cut (1.77 hares per ha (0.72 hares per ac)) (Homyack 2003). Pre-commercially thinned stands averaged about half the hare density (0.98 hares per ha (0.40 hares per ac)) as unthinned stands. Hare densities in mature conifer forests with sparse understories were low (0.23 hares per ha (0.09 hares per ac)). Lowest hare densities were in partial-harvest cuts (0.15 hares per ha (0.06 hares per ac)). In Montana, preliminary results of research since 1998 found that in winter snowshoe hare densities were high in mature forests with abundant understories and lowest in stands that had been pre-commercially thinned or in sparsely-regenerating clear-cut; in this study standard pre-commercial thinning had a negative effect on snowshoe hare densities in most places and times (Mills and Griffin, in litt. 2003). Furthermore, preliminary findings in Montana substantiate what scientists have generally presumed—snowshoe hares are exposed to higher predation and suffer higher mortality rates in forest stands with open understories (Mills and Griffin, in litt. 2003).

The final rule also explained that fire has an important role in forest ecology in some forest types in the United States. During the early 20th century, Federal and State agencies in the contiguous United States enacted a policy of suppressing forest fires. The effects of fire suppression, as well as timber harvest, on lynx habitat vary among the geographic regions (Agee 2000) and will be discussed separately below.

Except in the Northeast, a substantial amount of lynx habitat in the contiguous United States occurs on Federal lands, primarily National Forests and BLM lands (see Table 1). Since the listing of the lynx in 2000, Conservation Agreements the U.S. Forest Service and BLM have signed with the Service (Bureau of Land Management and U.S. Fish and Wildlife Service in litt. 2000; U.S. Forest Service and U.S. Fish and Wildlife Service in litt. 2000), and the programmatic biological opinion on National Forest and BLM land management plans (U.S. Fish and Wildlife Service 2000) committed the U.S. Forest Service and BLM to use the LCAS in determining the effects of actions on lynx (Ruediger *et al.* 2000). The final rule explained that the LCAS was developed to provide a consistent and effective approach to conserve lynx and lynx habitat on Federal lands across its range in the contiguous United States (Ruediger *et al.* 2000). The U.S. Forest Service further committed to deferring any actions not involving third parties that would adversely affect lynx until such

time as the Forest Plans were amended or revised to adequately conserve lynx. Adherence to the Conservation Agreements, the biological opinion, and the LCAS in assessing the impacts of Federal actions on lynx alleviates the affects of National Forest and BLM land management plans and the activities they allow on lynx, such as timber harvest or fire management, that were identified in the final rule and the 1999 biological assessment (U.S. Forest Service and Bureau of Land Management 1999) (see Factor D).

Northern Rocky Mountains/Cascades and Southern Rocky Mountains

In the final rule, we recognized that the Northern Rocky Mountains encompass more privately-owned lynx habitat than elsewhere in the west (U.S. Forest Service and Bureau of Land Management 1999). In the final rule, we stated that almost one-third of lynx habitat is in private ownership (U.S. Forest Service and Bureau of Land Management 1999). Although we lacked specific information when we published the final rule, we recognized that large portions of this habitat likely occur on privately-owned corporate timber lands where timber harvest and thinning occurs. Data regarding private lands is generally not as available as data pertaining to Federal lands; as a result, few data are available concerning the quality of lynx and snowshoe hare habitat on private lands. However, preliminary results of research conducted on privately-owned corporate timber lands in northwestern Montana show that such lands provide varying levels of snowshoe hare densities (abundant to low), depending on the timber harvest regime (Mills and Griffin, in litt. 2003).

The final rule identified that the majority of lynx habitat in the west occurs on Federal lands. According to assessments in 1999, in the Northern Rocky Mountains, 72 percent of lynx habitat is on National Forest or BLM lands, 99 percent in the Cascades, and 82 percent in the Southern Rocky Mountains (U.S. Forest Service and Bureau of Land Management 1999). As currently mapped, in the Northern Rocky Mountains/Cascades region there are approximately 96,000 km^2 (37,000 mi^2) of lynx habitat on National Forest Lands and approximately 1,236 km^2 (477 mi^2) on BLM lands (see "Table 1") (E. Johnston, in litt. 2003; J. Whitney, in litt. 2003). In the Southern Rocky Mountain region there are approximately 30,000 km^2 (12,000 mi^2) of lynx habitat on National Forest Lands and approximately 700 km^2 (280 mi^2) on BLM lands (see Table 1) (E. Johnston, in litt.2003; J. Whitney, in litt. 2003).

Federal lands are managed as either "developmental" or "non-developmental" allocations. Lands in developmental allocations are managed for multiple uses, such as recreation and timber harvest, some of which may conflict with conservation of lynx. Lands within non-developmental allocations are managed for the most part to allow natural ecological processes to dominate and contain large portions of wilderness or other natural areas (U.S. Forest Service and Bureau of Land Management 1999; D. Prevedal, U.S. Forest Service, in litt. 1999). Timber harvest and construction of roads or fire suppression typically do not occur or are very limited in lands managed in non-developmental allocations. Lynx (including introduced lynx in Colorado) continue to be broadly distributed throughout lynx habitat in the Northern Rocky Mountains/ Cascades and Southern Rocky Mountains (McKelvey *et al.* 2000b; T. Blickensderfer, in litt. 2003), both inside and outside of non-developmental allocation areas (U.S. Forest Service and Bureau of Land Management 1999).

Non-developmental allocations are beneficial for lynx because they are managed for the most part to allow natural ecological processes to dominate. This is significant, because in the Northern Rocky Mountains, 41 percent of lynx habitat is in non-developmental allocations; in the Cascades, 85 percent of lynx habitat is in non-developmental allocations; and in the Southern Rocky Mountains, 23 percent is in non-developmental status (U.S. Forest Service and Bureau of Land Management 1999).

The final rule described the amount of lynx habitat managed in developmental allocations for multiple uses in the Northern Rocky Mountains/Cascades, and Southern Rocky Mountains. In the Northern Rocky Mountains, 59 percent of lynx habitat is in developmental allocations, in the Cascades 15 percent, and in the Southern Rocky Mountains 77 percent (U.S. Forest Service and Bureau of Land Management 1999). Activities that may be detrimental to lynx or lynx habitat, such as some timber harvest regimes and fire suppression, can occur in developmental allocations.

Timber harvest levels on Federal land in the West have declined consistently and dramatically (approximately 80 percent) over the past decade or longer (R. Gay, U.S. Forest Service, in litt. 1999). Timber harvest in specific lynx forest types also has declined in the Northern Rocky Mountains (B. Ballenbacher, U.S. Forest Service, in litt. 1999; B. Ferguson, U.S. Forest Service, pers. comm. 1999), Cascades (F. Zenson, U.S. Forest Service, pers. comm. 1999), and the Southern Rocky Mountains (B. Short, U.S. Forest, in litt. 1999).

On National Forest lands, with a few exceptions for projects involving third parties (applicants), activities that may affect lynx on developmental allocations are addressed by adherence to the LCAS and its conservation measures for lynx. For example, the Forest Service has curtailed its precommercial thinning on Forest Service land since the signing of its Conservation Agreement with the Service and the programmatic biological opinion on Forest and BLM land management plans, both of which abide by the LCAS (see Factor D). Risks to lynx or lynx habitat on BLM lands also are being addressed through adherence to the Conservation Agreement. Most Federal land management plans have yet to be amended to provide long-term conservation for lynx.

Timber harvest activities on non-Federal lands are guided by State or Tribal forest practice rules whose requirements vary (*e.g.*, Idaho Department of Lands 1996, Washington Administrative Code 2001, Montana State Forest Practices Rules 2003). Under Washington Forest Practices Board regulations, three major non-Federal landowners have adopted and implemented lynx habitat management plans on their lands in Washington (see Factor D).

We conclude that some timber harvest activities, such as pre-commercial thinning, may reduce the quality of snowshoe hare habitat in local areas on non-Federal lands in the Northern Rocky Mountains/Cascades and Southern Rocky Mountains, and thus may negatively affect lynx or lynx habitat at local scales. Alternatively, timber harvest regimes in lynx habitat that create a dense understory provide good snowshoe hare and lynx conditions. A significant proportion of lynx habitat is managed in non-developmental status, which is beneficial for lynx. Furthermore, lynx habitat on National Forest and BLM lands is managed to conserve lynx. As a result, we conclude the current threats from timber harvest and thinning on both non-Federal and Federal lands to lynx in the Northern Rocky Mountains/ Cascades and Southern Rocky Mountains are low.

The final rule explained that natural fire plays a significant role in creating the mosaic of vegetation patterns, forest stand ages and structure that provide good lynx and snowshoe hare habitat in the western mountain ranges of the

United States. The final rule also explained that fire suppression in the Northern Rocky Mountains/Cascades and Southern Rocky Mountains during the past 50 years has likely had little impact on lynx, because most forests where lynx habitat occurs have natural fire return intervals that are longer than the period of time of human fire suppression or because fires that do occur in lynx habitat are large, high-intensity fires that are difficult to suppress. Where fire suppression does occur in lynx habitat, it can reduce the quality of habitat by reducing the amount of younger forests or by changing the species composition and structure of forests.

Because of the many large forest fires in the West since 2000, there is increased national interest in reducing the risk of fire by reducing fuel loads on both Federal and non-Federal lands (U.S. Department of Agriculture and U.S. Department of the Interior 2001). Such efforts can affect lynx habitat if they reduce the amount of understory vegetation. Understory removal may affect the capability of stands to support snowshoe hares. At this time, few of these fire suppression efforts have been implemented, so it is impossible to analyze their effects on lynx. The LCAS recommends that on Federal lands fire be restored as an ecological process. The U.S. Forest Service and BLM use the LCAS in determining the effects of their actions on lynx (see Factor D).

As in the final rule, we conclude that past fire suppression has had limited impact in lynx habitat in the Northern Rocky Mountains/Cascades and Southern Rocky Mountains; however, it may affect lynx habitat quality at some local scales, particularly on non-Federal lands. Although increased interest in fire suppression and reduction of heavy fuels has the potential to affect snowshoe hare habitat, we conclude the threat to lynx in the Northern Rocky Mountains/Cascades and Southern Rocky Mountains as a result of the current effects of fire suppression is currently low.

Northeast

In the Northeast, lynx habitat is supported almost entirely on a non-Federal land base (private, State, or county), predominantly commercial forest lands, as was recognized in the final rule. The final rule discussed activities that may affect lynx in the Northeast Region. It described the history of logging and forest management through the 1800s and 1900s and the effects on lynx habitat in this region.

Since the final rule, our understanding of forest conditions in Maine, which is the core of the lynx range in the Northeast, has improved. Historically, large-scale natural disturbances (wind, ice, and insect epidemics) and traditional forestry practices (including some level of clear-cutting) created the early successional forest stages where snowshoe hares generally are most abundant. In response to insect outbreaks in the 1970s and 1980s, extensive clear-cutting to salvage diseased trees and subsequent herbicide use to promote regrowth of conifers created the current forest conditions that are optimal for snowshoe hares and lynx (Hoving 2001; Homyack 2003, Krohn 2003; G. Matula, in litt. 2003). Currently, large amounts of the forest are in a stage of regeneration that supports high snowshoe hare densities (Homyack 2003). As a result, lynx numbers also are high (see "Maine" discussion, above).

At its peak in the late 1990s, 20 to 25 percent of the Maine forest was in an early regeneration stage (Gadzik *et al.* 1998), which is unnaturally high and out of proportion to historic conditions when only 3 to 7 percent of the forest was in this stage of regeneration (Krohn 2003). Nonetheless, this created exceptional snowshoe hare and lynx habitat.

Passage of the Maine Forest Practices Act has in 1989 limited the amount of clear cutting. As a result, forest landowners have changed their harvest practices to extensive use of pre-commercial thinning and partial harvesting rather than clear cutting (Gadzik *et al.* 1998, Homyack 2003; Krohn 2003). These techniques result in forest stands with sparse understories that support low snowshoe hare densities (Homyack 2003). If harvest practices cease to provide early successional forest with dense understories or stand-replacing disturbances (such as provided by large clear-cut) in proportions similar to historic conditions, habitat conditions for snowshoe hare and lynx will be diminished.

The quantity of lynx habitat in Maine is expected to decline as stands in late regeneration created by clear cutting in the 1970s and 1980s succeed to mature forest. Snowshoe hare populations begin to decline in stands about 30 years after clear cutting when the forest canopy closes, shading increases at ground level, and the dense understory that supports high populations of snowshoe hares is greatly reduced. Over 95 percent of cutting that occurs now is partial harvesting (selective cutting, patch cuts). This new cutting regime supports lower populations of snowshoe hares (Fuller 1999, Homyack 2003) and will not provide the large patches of regenerating forest that support the more numerous lynx populations observed at the present time.

As explained in the final rule, in Northeast forests fire return intervals are very long as a result of the moist maritime influence. Thus, fire did not historically play a significant role in creating early successional habitats. While current fire suppression may have localized minor effects, it is not likely affecting lynx habitat overall in the Northeast.

As recognized in the final rule, timber harvest and associated activities on non-Federal lands exert the most influence on lynx habitat in the Northeast and have created the optimal conditions that currently exist for lynx and snowshoe hares in northern Maine. At this time, we do not know if future timber harvest practices will continue to provide forest conditions that are capable of supporting snowshoe hare densities that can, in turn, support a resident lynx population. We conclude the threat to lynx in the Northeast because of timber harvest and associated activities is moderate, although it may have more severe impacts if a natural mosaic of forest stand ages and structure that can support snowshoe hares and lynx is not maintained.

Great Lakes

The final rule described habitat conditions for lynx in the Great Lake Region. It described the history of logging and forest management through the 1800s and 1900s that was similar to the history in the Northeast.

We know that the estimate of lynx habitat provided in 1999 (U.S. Forest Service and Bureau of Land Management 1999) substantially overestimated the amount of lynx habitat in the Great Lakes because of the coarse-scale vegetation map on which the estimate for the Great Lakes was based (see "Great Lakes" discussion above). By using more accurate maps we now know that the majority of lynx habitat in the Great Lakes is on Federal lands, primarily National Forest lands, contrary to the information used in the final rule that incorrectly portrayed a high proportion of lynx habitat on non-Federal lands (Great Lakes Ecological Assessment no date, Mladenoff no date; Minnesota Department Natural Resources, in litt. 2003; Wisconsin Department Natural Resources, in litt. 2003). In the Great Lakes Region, approximately 18,000 km^2 (7,000 mi^2) of lynx habitat are currently mapped on National Forest lands (Table 1).

Unfortunately, an accurate estimate of the amount of lynx habitat across all land ownerships in the Great Lakes is still not available.

A large amount of the boreal forest in northeastern Minnesota where lynx are found is managed as the Boundary Waters Canoe Area Wilderness (4,160 km^2 (1,600 mi^2)) (Superior National Forest website). Wilderness is managed to let natural ecological processes dominate, which is beneficial to lynx.

The final rule recognized that timber harvest is the predominant use of the forests where lynx habitat occurs in the Great Lakes region; the final rule also explained that timber harvest levels on National Forest lands in the Great Lakes have declined by approximately 20 percent over the past decade (R. Gay, U.S. Forest Service, in litt. 1999). As described in the final rule, mixed conifer/hardwood stands are often replaced and maintained in pure deciduous stands because of the importance of aspen as a crop tree (Agee 2000). On managed timber lands in all ownerships, the maintenance of aspen to produce pulpwood precludes the establishment of coniferous forest types, which in turn likely diminishes snowshoe hare habitat quality.

The final rule described natural fire regimes and the history of fire suppression in the Great Lakes. Fire suppression policies across all land ownerships in the Great Lakes are such that fire is unlikely to assume its natural role in creating a mosaic of vegetation communities and age classes across the landscape. However, the final rule established that on some Federal lands in northeastern Minnesota, where the region's highest quality and quantity of lynx habitat is found, and where numerous lynx have been documented in the past 3 years (Minnesota Department of Natural Resources in litt. 2003), fires are allowed to burn. The LCAS recommends that on Federal lands fire be restored as an ecological process. Locally, fire suppression may reduce the quality of lynx habitat in the Great Lakes.

Since the listing of the lynx in 2000, activities that may affect lynx on National Forest lands are addressed by the U.S. Forest Service's adherence to the LCAS in alleviating the impacts of actions on lynx (see Factor D). However, at this time, most Federal land management plans have not been amended or revised to provide long-term conservation of lynx.

We conclude that timber harvest and fire suppression on non-Federal lands may cause local impacts to lynx and snowshoe hare habitat in the Great Lakes Region. Since the lynx was listed, lynx habitat on National Forest lands is managed to conserve lynx. As a result, we conclude the threat to lynx in the Great Lakes because of timber harvest and fire suppression is low.

Factor B. Overutilization for Commercial, Recreational, Scientific, or Education Purposes

The final rule explained that one of the primary reasons we proposed to list lynx, based on available information at the time, was our conclusion that the low numbers of lynx in the contiguous United States and southern Canada were the residual effects of over-trapping believed to have occurred in the 1970s and 1980s, in response to unprecedented high pelt prices, a concern that was widely shared (Brand and Keith 1979; Todd 1985; Bailey *et al.* 1986; Hatler 1988; Washington Department of Wildlife 1993).

The final rule explained the variables that influence trapping records and the use of such records as indicators of historic lynx population changes. The final rule recognized that trapping mortality can either compensate for natural mortality or be in addition to natural mortality, depending on when it occurs in the population cycle. The final rule described trends in lynx pelt prices, and we will not restate them here.

The final rule explained that based on information obtained after public review and comment of the proposed rule in 1998, we now recognize that the cyclic peak harvest returns of the early 1960s and 1970s were unprecedented highs for the 20th century (McKelvey *et al.* 2000b; Mowat *et al.* 2000). Wildlife managers may have expected harvest returns during the 1980s and 1990s to be comparable to the anomalous cyclic peaks of the 1960s and 1970s. When harvest returns failed to be as high as anticipated, managers interpreted the lower returns to be caused by overtrapping when pelt prices were high (Bailey *et al.* 1986; Hatler 1988; Hash 1990; Washington Department of Wildlife 1993). We compared the lynx harvest returns in the 1980s and early 1990s to harvest data dating back over a longer period of time (*i.e.*, prior to 1960) and found that lynx harvest returns were not unusual nor appreciably lower than those recorded prior to the 1960s.

To demonstrate that lynx harvest returns in the 1980s and 1990s were not substantially different from returns prior to the 1960s and that wildlife managers were inappropriately using returns from the 1960s and 1970s as the standard on which to compare subsequent returns and set seasons, the final rule thoroughly described historic trapping data for Minnesota, Montana, and Washington, which will not be restated here.

The final rule explained that Mowat *et al.* (2000) suspected that over-trapping may deplete local lynx populations, particularly at the southern part of the lynx's North American range, but that dispersal of lynx from healthy populations has led to the repopulation of such areas. States and Tribes closed lynx trapping seasons prior to the listing of the lynx, which, in addition to the listing of lynx under the Act, eliminated the mortality of lynx through legal lynx-targeted trapping and we have no information suggesting that illegal lynx-targeted trapping occurs in the contiguous United States. We continue to believe that precautions taken by States and Provinces to restrict lynx trapping since the 1980s likely have prevented and continue to prevent the over-harvest of resident lynx. Most Canadian provinces control for potential over-trapping by closing the lynx trapping seasons during the lows in the lynx population cycle (*e.g.*, Environment et faune Quebec 1995). However, some theorize that lynx harvest in Canada reduces the numbers of lynx that could potentially disperse to the contiguous United States. In the final rule we explained that low numbers of lynx in the contiguous United States compared to Canada occur not as a result of over-trapping, but because the prey of lynx is limited by naturally fragmented habitat, topography, and climate.

As we emphasized in the final rule, legal trapping, snaring, and hunting for bobcat, coyote, wolverine, and other furbearers create a potential for incidental capture or shooting of lynx. We know that incidental capture and shooting occurs (Wydeven 1998; M. DonCarlos in litt. 1994; Colorado Department of Wildlife 2003; R. Naney, U.S. Forest Service, pers. comm. 1999, B. Giddings, Montana Fish, Wildlife and Parks, pers. comm. 2001; C. McLaughlin, Maine Department of Inland Fisheries and Wildlife, pers. comm. 2001; J. Cochrane, U.S. Fish and Wildlife Service, pers. comm. 2003; M. McCollough pers. comm. 2003); no reliable recordkeeping exists to determine how frequently such taking occurs. The effect on the individual lynx captured has varied, usually depending on the type of trap or the set and whether the trap was checked in time to successfully release or rehabilitate the animal. These captures have sometimes caused no injuries and the animal was immediately released back into the wild, sometimes lynx were injured but were rehabilitated and then

released into the wild, and sometimes the captures have resulted in mortality. Mortality of captured individuals likely has differing impacts on the ability of local populations to persist depending on the size of the local population and when the trapping occurs in the population cycle. Lynx persist throughout their range despite the incidental catch that presumably has occurred throughout the past, probably at higher levels than presently. Although we are concerned about the mortality of lynx that are incidentally captured, we have no information to indicate that the loss of these individuals has negatively affected the overall ability of lynx in the contiguous United States to persist. We recognize that individuals may be lost, which could affect small, local populations.

Based on the information described in this section, we conclude that legal, lynx-targeted harvesting does not occur and therefore is not a factor threatening the contiguous United States lynx population. The threat to lynx populations from illegal harvesting, if any, and incidental catch by trapping, snaring, or hunting is low.

Factor C. Disease or Predation

Mountain lions (*Puma concolor*) and fisher (*Martes pennanti*) have been documented to prey on lynx (Squires and Ruggiero 2001, G. Matula, in litt. 2003) but there is no information to suggest that these natural events are threatening lynx populations. Plague has been documented in the Colorado reintroduced population, but its overall impact is unknown at this time (T. Shenk, Colorado Division of Wildlife, pers. comm 2003). As in the final rule, we conclude that disease and predation are not factors threatening lynx.

Factor D. Inadequacy of Existing Regulatory Mechanisms

The final rule (1) outlined regulatory protections that States and Tribes within the range of the lynx have in place to provide protection to the species, (2) described how lynx is protected under the Convention on International Trade in Endangered Species (CITES), and (3) identified efforts on private lands to provide for the conservation of the species. These protections and efforts will not be reiterated here.

Timber harvest activities on non-Federal lands are guided by State or Tribal forest practice rules whose requirements vary (*e.g.*, Maine Forest Practices Act 1989); however, not all States or Tribes have forest practice rules.

The final rule discussed the fact that a substantial amount of lynx habitat in the contiguous United States is found on Federal lands, primarily National Forest and BLM lands. The final rule thoroughly described the purposes and analyses of the LCAS and the biological assessment of National Forest and BLM Land Management Plans (U.S. Forest Service and Bureau of Land Management 1999, Ruediger *et al.* 2000). At that time, we found that Federal land management plans did not adequately address risks to lynx and, as identified in the LCAS, that plans allowed actions that cumulatively could result in significant detrimental effects to lynx in the contiguous United States. As a result, we concluded in the final rule that the lack of Federal Land Management Plan guidance for conservation of lynx, and the potential for Plans to allow or direct actions that adversely affect lynx, were a significant threat to the contiguous United States lynx population.

As described in the final rule, the LCAS was developed to provide a consistent and effective approach to conserving lynx on Federal lands in the contiguous United States (Ruediger *et al.* 2000). The overall goals of the LCAS were to recommend lynx conservation measures, provide a basis for reviewing the adequacy with regard to lynx conservation of Forest Service and BLM land and resource management plans, and facilitate conferencing and consultation under section 7 of the Act, should the lynx be listed. The LCAS identifies an inclusive list of 17 potential risk factors for lynx or lynx habitat that may be addressed under programs, practices, and activities within the authority and jurisdiction of Federal land management agencies. For example, these risk factors include programs or practices that result in habitat conversion, habitat fragmentation, or obstruction to lynx movement; roads or winter recreation trails that facilitate access to historical lynx habitat by competitors; and fire suppression, which changes the vegetation mosaic maintained by natural disturbance processes. The risks identified in the LCAS are based on effects to either individual lynx, populations, both, or lynx habitat. Therefore, not all of the risks identified in the LCAS threaten lynx populations in the United States. For example, one risk factor identified for the Southern Rockies Region is accidental death from vehicle collisions. While this may result in the death of individual lynx, it is not considered to be a threat to lynx populations.

With the listing of the lynx in 2000, Federal agencies across the contiguous United States range of the lynx were required to consult with the Service on actions that may affect lynx. The LCAS assists Federal agencies in planning activities and projects in ways that benefit lynx or avoid adverse impacts to lynx or lynx habitat (Ruediger *et al.* 2000). The LCAS addresses potential risks including timber harvest and fire management. The LCAS ensures the appropriate mosaic of habitat is provided for lynx on Federal lands. For instance, both early successional forests and older forests with understory are important for lynx foraging habitat. The LCAS recommends that while timber harvest can result in early successional forests, harvest be limited to provide adequate amounts of older timber stands. Also, the LCAS recommends that no pre-commercial thinning occur in lynx habitat and no increase in designated or groomed snowmobile routes in lynx habitat. If projects are designed that fail to meet these or other recommendations, the biologists using the LCAS would arrive at an adverse effects determination for lynx. On National Forest lands such projects then would be deferred until Forest Plans are amended to conserve lynx.

A Conservation Agreement between the U.S. Forest Service and the Service (U.S. Forest Service and U.S. Fish and Wildlife Service in litt. 2000) and a similar Agreement between the BLM and the Service (Bureau of Land Management and U.S. Fish and Wildlife Service in litt. 2000) committed the U.S. Forest Service and BLM to use the LCAS in determining the effects of actions on lynx. The U.S. Forest Service further committed to deferring any actions not involving third parties that would adversely affect lynx, until such time as the Forest Plans were amended or revised to adequately conserve lynx. A programmatic biological opinion analyzed and confirmed the adequacy of the LCAS and its conservation measures to conserve lynx and concluded that Forest and BLM land management plans as implemented in accordance with the Conservation Agreements would not jeopardize the continued existence of lynx (U.S. Fish and Wildlife Service 2000). Currently, the ongoing adherence to the Conservation Agreements, the LCAS, and the programmatic biological opinion alleviates the effects of Federal land management activities identified in the final rule. However, amendment of National Forest and BLM land management plans to conserve lynx will be the strongest mechanism in ensuring lynx and lynx habitat are conserved on

National Forest and BLM lands for the long term.

As a result of Federal, State, and Tribal regulations and plans that conserve lynx, the threats to lynx from the inadequacy of existing regulatory mechanisms have been reduced. However, until Federal land management plans are amended to address lynx, we conclude that the threat to lynx because of the inadequacy of existing regulatory mechanisms continues to be moderate, albeit at a lower level than that described in the final rule.

Factor E. Other Natural or Manmade Factors Affecting Its Continued Existence

Since the lynx was listed, our understanding of the vital role immigration of lynx from Canada plays in sustaining lynx in the contiguous United States has improved (Ray *et al.* 2002, Schwartz *et al.* 2002). In the final rule, we explained that connectivity of appropriate habitat types and cover provide travel corridors between habitat patches, thereby increasing the likelihood of successful lynx dispersal. It is essential that landscape connectivity between lynx habitats and populations in Canada and the contiguous United States be maintained. The final rule described the reduced ability for lynx from northern populations in Canada to cross the St. Lawrence River in southern Quebec and the St. Mary's River between Ontario and Michigan. At this time, we know of no natural or human-caused barriers that effectively prohibit movement of lynx between Canada and the directly adjacent regions of the contiguous United States (Northeast, Great Lakes, and Northern Rocky Mountains/ Cascades) that support lynx habitats and populations. The threat to lynx because of the lack of a cohesive international strategy to maintain connectivity between habitats in Canada and the United States is low.

The final rule also noted that for most areas of the contiguous United States, we have no evidence that human-caused changes have significantly reduced the ability of lynx to disperse or have resulted in the loss of genetic interchange. The final rule explained that high traffic volume on roads that bisect suitable lynx habitat and associated suburban developments (such as from ski area expansion) may inhibit lynx movement and dispersal and may contribute to loss of habitat connectivity. Such situations occur in the Southern Rocky Mountains Region connecting cities, towns, and ski areas. The final rule explained that roads do not appear to be a significant direct cause of mortality of resident lynx, but that the majority of records of lynx mortalities from vehicle accidents are of recently translocated animals. No information currently exists to determine the level at which traffic volume or roadway design may influence or create an impediment to lynx movements. In local areas, lynx may be negatively influenced by high traffic volume on roads that bisect suitable lynx habitat and associated suburban developments that contribute to loss of habitat connectivity; however, we conclude the overall threat to lynx populations from high traffic volume on roads that bisect suitable lynx habitat and associated suburban developments is low, although locally in Colorado the risk is higher.

Isolated, small resident lynx populations, such as may have existed in the Southern Rocky Mountains and New York, are susceptible to genetic or demographic problems or random environmental events (such as a series of years when snow conditions are poor such that lynx cannot out-compete other predators). As described in "Background" above, we surmise that immigration is necessary to augment and maintain local lynx populations, especially in transitional habitats at the southern margins of lynx range. The natural distance and isolation of the Southern Rocky Mountain region and New York from source lynx populations may have severely reduced, if not entirely precluded the immigration that was likely necessary for potential resident lynx populations in these areas to sustain themselves. This same analysis does not apply to dispersers because we consider dispersers to be transient individual animals that are not a part of a population; they contribute little to the persistence of the metapopulation unless they augment or colonize resident lynx populations. We recognize that individual lynx may be affected by random environmental events. We expect that many dispersing lynx naturally do not survive because they are unable to find adequate food resources and because of the risks naturally inherent in long-distance movements.

The final rule describes that lynx show no evidence of being displaced by or avoidance of unpaved forest roads. We find no information demonstrating that forest roads negatively impact lynx (Roe *et al.* 2001) and, therefore do not consider forest roads to be a threat to lynx.

The final rule discussed the theory that suggested that increasing ease of human access into forests increased the vulnerability of lynx to intentional or unintentional shooting and trapping. We are concerned about the mortality of lynx through legal or illegal trapping and shooting; however, we have no information to indicate that the loss of these individuals negatively affects the overall ability of lynx populations to persist. We conclude the threat to the threat to lynx populations from incidental catch by trapping, snaring, or hunting is low (see Factor B above).

There continues to be no data on the role of competition between lynx and other species; therefore, we have only information on behavior and morphological adaptations of lynx and of potential competitors during both winter and snow-free seasons from which to gain some inferences about competition and whether it has an impact on lynx, as was thoroughly described in the final rule. Bobcats, mountain lions, and fishers are natural potential competitors or predators that coevolved with lynx. As described in the final rule, the coyote expanded its range into that of the lynx within the past century so any potential for competition between these two species may be considered unnatural. Deep snow provides lynx its competitive advantage. The final rule explained that human alteration of forests may create habitats that may be more suitable to potential lynx competitors. At this time there is no evidence that, if competition exists between lynx and any of these species, it exerts a population-level impact on lynx; therefore, we do not consider competition to be a threat to lynx.

Research scientists in the Missoula Wildlife Ecology unit of the Forest Service Rocky Mountain Research Station, in cooperation with the Northern Region of the Forest Service and the Superior National Forest in Minnesota, recently discovered evidence of hybridization between bobcats and Canada lynx. This is the first time hybridization has been reported in wild populations of these species. As a result of this finding, the Forest Service has conducted a DNA analysis of most of the lynx hair samples collected as part of the National Lynx Survey to help determine if hybridization has occurred elsewhere. So far, no additional instances of hybridization have been detected. This phenomenon may have implications for lynx conservation, but additional sampling and analysis are required before biologists will be able to fully understand the significance of the hybridization (D. Tippetts, U.S. Forest Service, in litt., 2003).

Despite the lack of evidence that competition with any species is negatively affecting lynx, the final rule explained the theory that ski and snowmobile trails and roads that are maintained for winter recreation and forest management create packed snow corridors that give other species, particularly coyotes, access to lynx winter habitat on all land ownerships. This theory has neither been proven or disproven at this time (Roe *et al.* 2000). On the basis of this theory, the LCAS provides that there be no net increase in groomed or designated over-the-snow routes and snowmobile play areas on Federal lands (Ruediger *et al.* 2000). The U.S. Forest Service and BLM are committed to adhering to their Conservation Agreements with the Service and the programmatic biological opinion on Forest and BLM land management plans that require the U.S. Forest Service and BLM to use the LCAS in determining the effects of actions on lynx (see Factor D). Because no evidence has been provided that packed snowtrails facilitate competition to a level that negatively affects lynx, we do not consider packed snowtrails to be a threat to lynx at this time.

During the public comment period on this remanded decision, we received information that predicted that if snow depths substantially decrease for a long period of time, lynx habitat will no longer exist in the Northeast (Hoving 2001). Hoving's (2001) model predicted that lynx were most likely to occur in areas with deep snow (greater than 268 cm (105 in) of mean annual snowfall). Hoving (2001) modeled possible consequences to the availability of lynx habitat in the Northeast as determined by snow depth. His predictions were only based on a comparison of average annual snow depths in the 1970s to those of the 1980s, not on models of future climate. Hoving (2001) acknowledged that the 1970s were unusually snowy whereas the 1980s was a period of relatively little snow. If average annual snow depth substantially decreases in the Northeast, as Hoving (2001) theorized could happen as a result of global warming, appropriate lynx habitat would be diminished and could be completely eliminated if appropriate climate conditions did not return. We conclude the potential for long-term reductions in snow depth because of climate change is speculative at this time and is not a threat to lynx.

TABLE 2

	Magnitude of threat			
	Northeast	Great Lakes	Southern Rockies	Northern Rockies/ Cascades
Factor A:				
Timber harvest regimes	Moderate	Low	Low	Low.
Fire suppression	Not a threat	Low	Low	Low.
Factor B:				
Legal lynx-targeted harvest	Not a threat	Not a threat	Not a threat	Not a threat.
Incidental harvest	Low	Low	Low	Low.
Factor C	Not a threat	Not a threat	Not a threat	Not a threat.
Factor D:				
Federal land management plan guidance.	Not a threat	Moderate	Moderate	Moderate.
Factor E:				
International strategy	Low	Low	Low	Low.
High volume traffic/development	Low	Low	Moderate	Low.
Forest roads	Not a threat	Not a threat	Not a threat	Not a threat.
Competition	Not a threat	Not a threat	Not a threat	Not a threat.
Global warming	Not a threat	Not a threat	Not a threat	Not a threat.

Finding

Based on the information provided in the final rule and the analysis provided above about the range of the lynx and the five factors contained in section 4(a)(1) of the ESA, we find that the lynx is not endangered because it is not in danger of extinction throughout a significant portion of its range. The way the lynx is affected varies across the range and there is not any particular activity that poses a threat consistently throughout the range of the species. Activities that may impact the lynx and its habitat are typically localized and even within a local area the impact an activity may have on lynx can vary depending on the quality and quantity of habitat in a local area or the size of the local resident population. In some portions of the range, lynx and its habitat face few or no threats (*e.g.*, in wilderness areas in the Great Lakes, Southern Rocky Mountains, and Northern Rocky Mountains/Cascades).

Activities addressed in the factors contained in section 4(a)(1) are not of the magnitude or scope to require us to list the species as endangered. We base our finding that lynx is not endangered on the following factors:

(1) Lynx in the contiguous United States are, and historically have been, the southernmost segment of a larger metapopulation whose center is in Canada. Immigration from Canada is, and historically was, vital to sustaining lynx in the contiguous United States.

(2) In the contiguous United States, lynx habitat consists of the southern extensions of the boreal forest in the Northeast, Great Lakes, Southern Rocky Mountains, and Northern Rocky Mountains/Cascades. The overall quantity and extent of boreal forest in these areas has not substantially changed in the past century because, for the most part, areas where lynx habitat occurs are still managed as forest lands, although there may have been a low level of encroachment in lynx habitat because of human development in some local areas. The quality of the boreal forest varies because it is a naturally dynamic ecosystem. To support lynx, the boreal forest must contain the mosaic of appropriate species composition, forest stand ages, and forest structure that provide snowshoe hare habitat for lynx foraging and lynx denning conditions.

(3) Lynx habitat occurs on lands owned and managed by Federal, Tribal, State, County, and private individuals and entities. Although we do not have information that allows us to accurately quantify how much habitat for lynx exists in the contiguous United States,

in the Northeast nearly all lynx habitat occurs on private lands. In the Great Lakes, Southern Rocky Mountains, and Northern Rocky Mountains/Cascades, lynx habitat occurs primarily on Federal lands, although a portion does occur on State, Tribal, or private lands. Based on coarse vegetation maps, potential lynx habitat was roughly estimated to be 65,337 km^2 (25,227 mi^2) in the Northeast; 96,247 km^2 (37,161 mi^2) in the Great Lakes; 26,673 km^2 (10,298 mi^2) in the Southern Rocky Mountains; and 155,893 km^2 (60,191 mi^2) in the Northern Rocky Mountains/Cascades (U.S. Forest Service and Bureau of Land Management 1999).

(4) The current range of the lynx includes portions of Colorado, Idaho, Maine, Michigan, Minnesota, Montana, New Hampshire, New York, Oregon, Utah, Vermont, Washington, Wisconsin, and Wyoming. The historic range of the lynx included these same States. The range of the lynx has not been dramatically reduced. We believe all historic habitat is still available to dispersing lynx except for very local areas where development has encroached on the boreal forest. A resident population does not exist in New York. We do not know if New York or the Southern Rockies ever supported resident lynx populations, but efforts at reintroduction of lynx in New York were unsuccessful and it would be premature to judge ongoing reintroduction efforts in Colorado (although reproduction has recently been documented).

(5) In the contiguous United States, the quality and quantity of the available habitat and its proximity to source populations influenced whether lynx historically were able to establish resident populations or occurred primarily as dispersers. The best scientific information suggests that historically only a few areas in the contiguous United States had lynx habitat of high enough quality and quantity to support resident populations and these are areas where resident populations currently continue to persist—northern Maine, northeastern Minnesota, western Montana, and north-central and northeastern Washington. Evidence of the continuing high quality habitat of these areas is indicated by the fact that currently there are many more lynx in these areas where resident populations exist (particularly in Maine and northeastern Minnesota) than we knew at the time we listed the species in 2000. Northern New Hampshire and northern Idaho currently have habitat conditions presumed capable of supporting lynx and are directly adjacent to resident populations; therefore we expect lynx occupy these areas.

The areas where resident populations occur are where habitat for lynx has consistently been of sufficient quality and quantity to support abundant snowshoe hare populations so that lynx are able to successfully produce kittens that are then recruited into the population. These habitats are of sufficient quality and quantity such that snowshoe hare populations at cyclic lows are still able to support a minimal number of lynx in the area, although we do not expect that lynx successfully reproduce when hare populations are low. Additionally, the habitat quality and quantity can support immigrants from Canada that colonize new areas or contribute to existing populations. In reality, in each region these areas are an artifact of the international border between Canada and the United States that artificially splits them into two pieces of a whole that exists primarily in Canada. This is most evident in Minnesota and Ontario—it appears sometimes the Ontario lynx population expands and occupies Minnesota and sometimes it contracts and lynx recede from Minnesota.

Historically, both Colorado and New York may have supported small resident lynx populations that may have been extirpated, although we are uncertain because historic records in these areas also may have been of dispersers that arrived during extremely high population cycles. In both Colorado and New York the last verified record of lynx was in 1973, a time that corresponds to an extreme cyclic population high. In both States there have been recent efforts to establish lynx populations. The attempt to establish a lynx population in New York in 1989–1991 was unsuccessful. The State of Colorado has undertaken an intensive effort to restore lynx in Colorado. Lynx have been released over the past 4 years into Colorado and reproduction was recently documented, but it is too early to determine if a population will be successfully established.

(6) In the remainder of the lynx range where some boreal forest exists in smaller patches, is of marginal quality, or is relatively isolated from source lynx populations, lynx occur as dispersers. We include boreal forest that supports only dispersers within the range of the lynx because of the possibility lynx could establish a local population and contribute to the persistence of the metapopulation. However, evidence of this is minimal. We consider these areas that only support dispersers within the range of the lynx—portions of Michigan, Oregon, Utah, Vermont, Wisconsin, and Wyoming.

(7) Areas that are outside of boreal forest types and that do not have cold winters with deep snow where dispersing lynx have sporadically been documented are not considered a part of the range of lynx because they do not contain the ecological conditions capable of supporting lynx. These areas include—Connecticut, Indiana, Iowa, Massachusetts, Nebraska, Nevada, North Dakota, Ohio, Pennsylvania, South Dakota, and Virginia.

(8) We conclude that large portions of range of the lynx in the Great Lakes, Southern Rocky Mountains, and Northern Rocky Mountains/Cascades are managed as non-developmental, such as designated wilderness areas, which is beneficial to lynx because it is managed to let natural ecological processes dominate. While there is some risk to lynx in these areas, these risks do not threaten lynx.

(9) We conclude there is a low threat to the contiguous United States lynx population because of the lack of a cohesive international strategy to maintain connectivity between habitats in Canada and the United States.

(10) We conclude there is a threat to the contiguous United States lynx population because of current effects of timber harvest and thinning and fire suppression on both non-Federal and Federal lands in the Northern Rocky Mountains/Cascades and Southern Rocky Mountains. We conclude that this threat is low. Although a majority of lynx habitat in these regions is on National Forest and BLM lands that are managed to conserve lynx, timber harvest regimes and fire suppression that may be locally detrimental to lynx and snowshoe hare habitat likely occurs on the limited amount of non-Federal lands that support lynx habitat in both the Northern Rocky Mountains/ Cascades and Southern Rocky Mountains.

(11) We conclude that lynx habitat may be impacted because of changing timber harvest regimes on non-Federal lands in the Northeast. We conclude the threat of these activities is moderate, although there is the potential for more severe impacts if a natural mosaic of vegetation ages and forest structure that can support snowshoe hares and lynx is not maintained.

(12) We conclude that lynx may be impacted because of timber harvest and fire suppression on non-Federal and Federal lands in the Great Lakes. However, the impact of these activities is low because a majority of lynx habitat in this region is on National Forest lands, which are managed to conserve

lynx; however, on the non-Federal lands in this region timber harvest regimes and fire suppression could cause local impacts to lynx and snowshoe hare habitat.

(13) Until Federal land management plans are amended or revised to address lynx, we conclude that the threat to lynx because of the inadequacy of existing regulatory mechanisms is moderate, albeit at a lower level than that described in the final rule.

(14) We conclude there is a threat to the contiguous United States lynx population from incidental catch by trapping, snaring, or hunting. We conclude this threat is low, although there may be an increased risk to small, local populations from incidental catch depending on when it occurs in the population cycle; however, we have no information regarding how frequently incidental trapping, snaring, or hunting of lynx occurs.

(15) We conclude that existing regulatory mechanisms do not ameliorate all of the threats contained in Factors A, B, and E. However, some regulatory mechanisms do minimize the impact some activities may have on lynx, such as regulations that prohibit the trapping and hunting of lynx in most States. While Federal land management plans have yet to be amended to adequately address lynx, Federal land managers have taken significant steps to minimize the impacts projects may have on lynx and manage habitat to conserve lynx until land management plans are amended.

(16) We conclude lynx are impacted by high traffic volume on roads that bisect suitable lynx habitat and by associated suburban developments. However, we conclude this impact is low because this situation rarely occurs throughout the range of lynx except in the Southern Rocky Mountains; however there is currently no native lynx population in this area.

Lynx in the Northeast are not in danger of extinction. As it has historically, the boreal forest of the Northeast exists primarily in Maine. Lynx habitat in Maine is currently optimal and a resident, breeding population of lynx continues to exist. Maine's lynx population is currently much larger than we knew at the time of the final rule in 2000 and lynx habitat in Maine is directly connected to substantial lynx populations and habitat in southeastern Quebec and New Brunswick. Future timber harvest regimes in Maine have the potential to reduce the amount of snowshoe hare habitat, which in turn would reduce the size of the lynx population. There are no barriers to the movement of lynx across the Canada-U.S. border. Coyote snaring in Maine poses a risk of incidental mortality to local lynx populations. The potential exists for lynx to occur in New Hampshire because of its direct connectivity with Maine and we presume they currently occur there. Lynx in Vermont have always existed solely as dispersers because Vermont naturally supports very little lynx habitat.

Lynx in the Great Lakes are not in danger of extinction. Northeastern Minnesota has historically supported, and currently supports, a resident lynx population. Boreal forest in Minnesota is contiguous with occupied habitat in Ontario. Currently, there are many more lynx in northeastern Minnesota than we knew of at the time of the final rule in 2000. The majority of lynx habitat in the Great Lakes area is located in Minnesota and is managed as Federal lands. Threats to lynx on these lands are alleviated because these Federal agencies use the LCAS to guide activities in lynx habitat. Amendment or revision of Federal land management plans to adequately address lynx is necessary to provide long-term lynx conservation. On non-Federal lands there is a low threat to lynx because of the potential for certain forms of timber management and fire suppression to reduce snowshoe hare habitat. Wisconsin and Michigan naturally support only dispersing animals. We base this assessment on the lack of evidence of reproduction, lack of direct connectivity with suitable habitat, and limited amount of habitat in these States.

We conclude that the only portion of the range where the lynx faces possible extirpation includes the Southern Rocky Mountains (primarily Colorado) and New York, to the extent that either of these areas historically supported resident populations. We believe the loss of these resident populations was a natural process because these areas are naturally isolated from source lynx populations and habitats; therefore, the immigration necessary to augment and maintain local lynx populations was naturally precluded. However, the State of Colorado is currently undertaking an intense effort to restore lynx to Colorado. If lynx in these areas historically consisted only of dispersers that arrived during extremely high population cycles, we have no evidence that anything would prevent further such dispersal into these areas in the future. In addition, to use the words of another court quoted with approval of the court in this case, to the extent that these areas never supported a resident population (as opposed to dispersers), these areas are not "areas in which [the lynx] is no longer viable but once was," because the lynx was never viable there. *Defenders of Wildlife* v. *Norton*, 258 F.3d 1136, 1145 (9th Cir. 2001) (quoted at 239 F.Supp.2d at 20). However, if we presume that both Colorado and New York historically supported resident populations, we find these areas do not constitute a significant portion of the range of lynx for the following reasons:

(1) Both areas constitute a comparatively small amount of the contiguous United States range of the lynx. Based on rough estimates, the Southern Rockies (primarily Colorado) supported only 8 percent of lynx habitat in the contiguous United States (U.S. Forest Service and Bureau of Land Management 1999); however, we know this proportion was somewhat underestimated because lynx habitat was overestimated in other regions. New York supports slightly more than 1 percent of lynx habitat just within the Northeast based on a current habitat model, and therefore only a small fraction of a percent of the habitat nationwide.

(2) The fact that historic records do not clearly demonstrate that these areas supported resident, breeding lynx populations indicates that these areas are of more marginal quality. Where habitat is abundant and of higher quality, there is evidence that resident, breeding lynx populations persist as indicated by high numbers of reliable lynx records over many years and evidence of reproduction. We do not have such information for either New York or the Southern Rocky Mountains. In fact, an effort to establish a lynx population in New York during 1989–1991 failed, potentially an indication that the habitat was not adequate to support a lynx population. Reproduction has recently been documented in an intensive lynx reestablishment effort currently underway in Colorado but it remains to be seen if the habitat is adequate to support a lynx population for the long-term without such intensive human intervention.

(3) Habitat appears marginal in the Southern Rocky Mountains and New York. In the Southern Rocky Mountains lynx habitat occurs at high elevations and, therefore, is naturally highly fragmented by topography and drier south- and west-facing slopes into island-like patches rather than expansive, contiguous blocks. The amount of potential lynx habitat in New York is estimated to be an area only slightly larger than the average home range of a single male lynx. Additionally, the boreal forest in New

York is protected as Adirondack State Park where much of the forest is mature and does not have the understory necessary to support a snowshoe hare population capable of sustaining lynx.

(4) Both of these areas are a relatively long distance and naturally more isolated from other lynx populations, substantially reducing the potential for lynx from northern populations to augment or colonize these areas or, alternatively, reducing the ability of lynx from these areas to have augmented or colonized other lynx habitats. Therefore the contribution of these areas to the persistence of lynx in the contiguous United States is presumably minimal.

We conclude that the contiguous United States DPS of the lynx is not in danger of extinction throughout a significant portion of its range within the Northeast, Great Lakes, or Southern Rockies and therefore does not warrant reclassification to "endangered" status in all or a significant portion of its range within these areas. As a result the Canada lynx will remain listed as threatened in Colorado, Idaho, Maine, Michigan, Minnesota, Montana, New Hampshire, New York, Oregon, Utah, Vermont, Washington, Wisconsin, and Wyoming.

References Cited

A complete list of all references cited herein, as well as others, is available upon request from the Montana Field Office (see **ADDRESSES**).

Author

The author of this document is Lori Nordstrom, Montana Field Office, Helena, Montana.

Dated: June 24, 2003.

Steve Williams,

Director, Fish and Wildlife Service.

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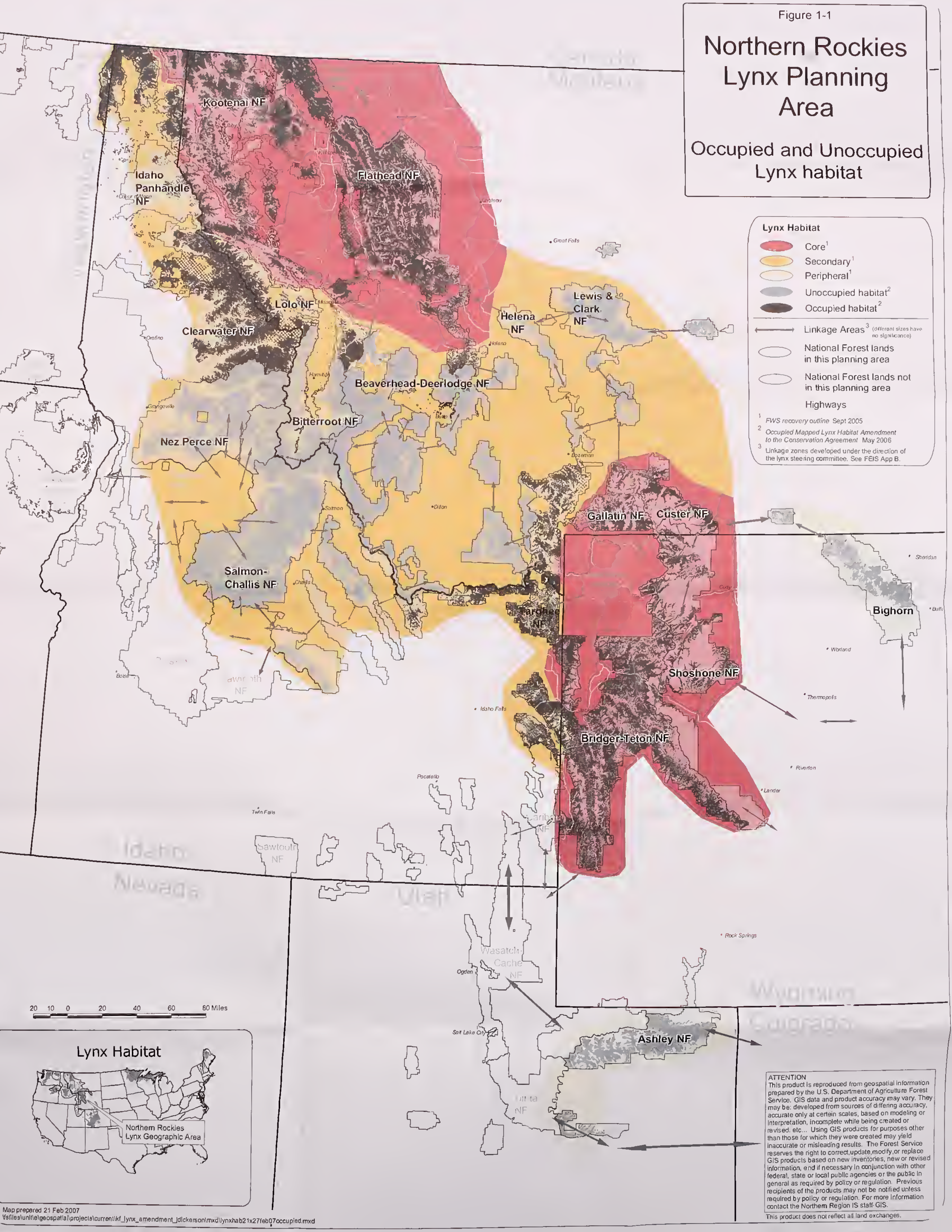

Figure 1-1
Northern Rockies Lynx Planning Area
Occupied and Unoccupied Lynx habitat
Lynx Habitat
Core[1]
Secondary[1]
Peripheral[1]
Unoccupied habitat[2]
Occupied habitat[2]
Linkage Areas[3] (different sizes have no significance)
National Forest lands in this planning area
National Forest lands not in this planning area
Highways
1 FWS recovery outline Sept 2005
2 Occupied Mapped Lynx Habitat Amendment to the Conservation Agreement May 2006
3 Linkage zones developed under the direction of the lynx steering committee. See FEIS App B.
Kootenai NF
Flathead NF
Idaho Panhandle NF
Lolo NF
Clearwater NF
Helena NF
Lewis & Clark NF
Beaverhead-Deerlodge NF
Bitterroot NF
Nez Perce NF
Salmon-Challis NF
Gallatin NF
Custer NF
Targhee NF
Bighorn
Shoshone NF
Bridger-Teton NF
Caribou NF
Sawtooth NF
Wasatch-Cache NF
Ashley NF
Uinta NF
Great Falls
Helena
Missoula
Bozeman
Dillon
Salmon
Challis
Hamilton
Butte
Grangeville
Orofino
Coeur d'Alene
Sheridan
Buffalo
Cody
Worland
Thermopolis
Riverton
Lander
Idaho Falls
Pocatello
Twin Falls
Boise
Ogden
Salt Lake City
Rock Springs
Idaho
Nevada
Utah
Wyoming
Colorado
Montana
Washington
20 10 0 20 40 60 80 Miles
Lynx Habitat
Northern Rockies Lynx Geographic Area
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